

REPORT OF THE PRESENT STATUS OF WILDLIFE MANAGEMENT  
IN YELLOWSTONE NATIONAL PARK  
WITH  
SUGGESTED RECOMMENDATIONS FOR FUTURE TREATMENT

April 19, 1935

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For several years past Yellowstone Park officials have found it advisable and necessary to direct the ranger personnel in a more and more concentrated pursuit of wildlife studies. New wildlife problems are constantly being introduced and to a certain extent all problems are closely related. Considerable progress has been made in the study of many of the park's wildlife problems, but successful future management demands a more definite and thorough study plan.

Short time studies or general surveys introduce the problems that require study and suggest logical methods of study rather than offering sufficient proof for conclusive decisions. Successful wildlife studies calls for full-time concentrated effort and study over a period of years. The majority of the observer's time must essentially be spent in the field. This of course must be supplemented with a complete set of notes. The observer should keep posted on wildlife studies that have been made and are being made in other localities. This calls for considerable outside reading, but is quite important.

With the present limited Yellowstone Park ranger personnel it has been impracticable if not impossible to assign more than one ranger at a time to full-time wildlife studies. Other more important or equally important work has demanded the attention of the force. The supervision of recent additional emergency projects has interfered considerably with wildlife studies in Yellowstone National Park. Even with the rangers assigned to wildlife studies interruptions occurred because of emergencies arising that demanded additional personnel for other more important administrative projects. All the rangers in the park, however, have cooperated, as far as time and opportunity would permit, in gathering and reporting data relative to wildlife studies. This latter has been very helpful and it cannot be stressed too strongly that every observation and every item of scientific datum should be recorded and saved, regardless of how unimportant it may appear at the time. The piecing together of these minor items may complete the story along the line of study.

Antelope, American Pronghorn  
(*Antilocapra americana americana*)

Present status: The antelope herd of the park appears to be in exceptionally fine condition. During the recent years no disease of serious nature has been

noted in the herd. Six dead antelope were reported during the past year. Specimens reported were partially destroyed so that examinations could be made only in a general way. During the past year no loss by coyotes was reported. One specimen examined showed necrotic ulcers (foxtail) in the mouth, also decayed teeth. Another specimen examined in April of this year had surprisingly few ticks, while at that time heavy tick infestation was noticeable in the elk herds.

Because of numerous extra projects being carried on and unfavorable weather conditions no antelope count was made this spring. The estimated number is about 650. Counts and estimates of 1933 and 1934 were:

<u>Antelope:</u>	<u>Year</u>	<u>Count</u>	<u>Estimate</u>
	1933	599	700
	1934	381	700

Range condition: During the summer of 1934 the antelope ranged in the vicinity of the Gene Ranch, Tower Falls, Buffalo Ranch, Hellroaring district, Lamar river, Antelope creek, Specimen Ridge, and a few were observed several times on Swan Lakes Flats. Last winter after December 15 the antelope stayed close to their winter range in the vicinity of the Gene Ranch. Not until April 5 were they observed south of the old rifle range to any great extent. Due to light snowfall during the major portion of the winter the antelope were able to winter through in fair condition. All of the antelope range both summer and winter is in severely denuded condition.

Recommendations: A larger antelope herd would be undesirable until the range is restored to a considerable extent. With favorable range conditions the number of antelope will probably increase in proportion to the normal carrying capacity of the range unless disease should enter into the herd.

Close observations should be made at all times for symptoms of disease in the herd. When practicable thorough examinations should be made of all dead animals found. A more thorough study of the number of antelope both young and adults destroyed by coyotes during the spring and early summer months would be very valuable. This study has been fairly well covered during the winter months by rangers on patrol.

The foxtail eradication program planned under E.C.W. work program for this coming summer will be of considerable benefit to the antelope range. Continuance of the elk reduction program will probably benefit the antelope herd more than any one other step in game management.

Black Bear  
(Ursus americanus americanus)

Present status: There are about 600 black bears inhabiting the Yellowstone National Park. Less trouble was experienced from the bears during the past season than for the three previous seasons. Reasons for this cannot be definitely stated, but probably chiefly due to extensive reduction of undesirable bears during the summer seasons of 1932 and 1933. Only two bears were deemed to be of sufficient nuisance to warrant being killed last season.

Disease among Park bears is negligible. However, visceral examinations should be made when ever possible, especially in the connection with the study of Diphyllbothrium.

Continued hibernation studies are desirable, but not necessarily essential in carrying out a management program.

The major problem with bears at present is not their relationship to the rest of the wildlife of the park, but resulting injuries to visitors and damage to property as caused by the bears. The problem is even more complicated because many of the park visitors are not afraid of the bears, but look upon them as being "tame" animals. Further more many of the tourists refuse to believe the rangers, when told that bears are not to be trusted and that it is dangerous to feed the bears from the hand. It would be a conservative estimate to say that 75 percent of the public that visits Yellowstone National Park take a greater interest in the bears and their habits than any other single park attraction. The average visitor wants to see bears; many bears; and many times. We have been very, very, fortunate in having so few serious injuries inflicted by the bears upon our visiting public. Most of the injuries have been brought on, at least indirectly, by the visitors themselves.

Recommendations: Yellowstone Park visitors should have an opportunity to see bears, but not in boundless numbers nor at every turn in the road.

Under the present status bears are practically insusceptible to disease, have few natural enemies, are plentiful enough to be observed by everyone who spends a reasonable length of time in the park; there is no logical reason for encouraging them to multiply to untold numbers. Control measures are necessary and numerous plans have been suggested but no single plan will solve the whole problem. In bear control work numerous factors must be considered. Funds and available personnel are probably the two most limiting factors. "Tourist psychology" plus the habits and behavior of the bears are probably the factors that are least often considered.

Herein a few of the most feasible suggested control measures will be considered, and a recommended control plan will be suggested.

Warning the public: Warning the visitors against feeding the bears and recommending the removal of food stuffs from their cars has helped in a limited measure, and should be continued and stressed even more than it is at present. Warnings to the tourists through the circulation of park literature and announcements to groups (such as lecture periods) are probably the most satisfactory methods for handling. Warning individuals, who are observed feeding the bears, is necessary, but seldom satisfactory regardless of how tactful the ranger may have been. When warned, the average tourist becomes displeased and immediately takes offense. A few additional signs would be useful. However, at most of the strategical points signs have been already placed. One disadvantage to warnings is that not infrequently cars that have contained no food for several days are broken into by bears. The ranger is sure to hear about that. After repeated warnings it leaves the ranger an embarrassing situation to explain.

Fences: A fence, sufficiently high enough and strong enough to keep bears out of the camp ground, would be extremely expensive to build and unsightly to look at. The fence would have to extend considerable distance into the ground to prevent the bears from digging under. The average person

does not realize how great the obstacle must be that a bear cannot surmount. The strong, high woven wire fence surrounding the back court of Hamilton's camp ground store at Old Faithful is a striking example. One female black bear was observed to climb over the fence innumerable times during a summer season, but when any attempt was made to drive her from the court the only way she would leave was by way of the open gate. This bear's cubs were also observed in the court several times, although they were never actually observed climbing the fence.

Entrance gates to the fenced camp grounds would also be a considerable problem. A minimum of two gates would be required for every major camp ground. The gates would have to be kept shut at all times or the bears would soon learn the location of the "hole in the fence." Either automatic gates would have to be installed or gate keepers would have to be stationed at each gate, probably day and night.

Camp grounds are not the Park's only problem. Cars stopping at the house-keeping cabins are damaged almost as often as the cars stopping at the camp grounds. Cars parked along the road or at the lodges are not immune to bear damages. A fencing program, adequate for complete bear protection is limitless, and would give the park an appearance of a gigantic zoo..... with the bears as spectators.

Fencing the camp grounds with charged wires is absolutely out of the question. An electrical charge sufficiently strong to repel a bear would be hazardous for any tourist that might contact the wires. This would be especially dangerous at night or in vicinities where children might be playing.

Dogs: The use of dogs for driving away the bears has frequently been suggested. General observations would indicate that best results are obtainable with small dogs.

Objections to the use of dogs are numerous. Dogs will invariably create considerable commotion at night. During the summer season rangers frequently receive complaints from visitors regarding some tourist's dog that kept them awake all night. Dogs would require considerable attention. A dog that is too well fed is of little use. It would require considerable training of each dog before they could be taught to chase bears only. Probably the most successful method of handling dogs would be to put them on a leash with the other end of the leash made to slide over a wire stretched between two posts. It is doubtful if the use of dogs in bear control work would meet with any degree of success around the loop stations. There would also be the additional problem of caring for the dogs during the eight months of the year when not in use.

Stopping all bear feeding: Such a program would necessarily have to begin with the park visitors. To place a sufficient penalty upon bear feeding violators, in order to stop the feeding of bears by tourists, would probably bring far more criticism than do the present bear damages. To bring each offender before the judge would require numerous additional rangers. Secondly, bear-proof food caches and garbage containers would have to be installed at each camp ground. Feeding grounds would have to be abolished, and all garbage burned. For several years general bear damages to cars, tents, etc., would probably be considerably increased. Should the plan prove successful, after a period of years, only a comparatively few bears could be observed by the tourists. Park visitors are certain to object to this plan. Some of the other wildlife species would suffer to a slight extent.

Recommended methods for present bear control:

1. Continue to warn the park visitors about the dangers of feeding bears and of leaving food in their cars. Reprimand and warn each violator, and let it be definitely understood that they are breaking a park regulation (feeding bears from the hand) and doing so at their own risk.
2. Discourage the sale of "bear candy" by stores in the park.
3. Install bear-proof food caches at all main camp grounds and bear-proof garbage containers in all camp grounds.
4. Strive for a final objective of having bears appear only at the feeding grounds. Three feeding grounds for the bears should be a sufficient number. The feeding grounds should be widely separated as possible and not located too close to the populated areas. The present Canyon feeding ground makes a satisfactory location.

The bears must be forced and frightened away from the roads and populated areas. Best results should be obtained through the organization of "bear patrols." At present these patrols could be organized under an E.C.W. wildlife project. The sole purpose of such patrols would be to continually annoy and frighten the bears out of the camps. For best results the patrols should be functioning by April 1 each season, and continued into the late fall. Early patrols, before the arrival of summer visitors should be especially beneficial. Road patrols would also aid materially. Motorcycle patrolmen could assist in frightening the bears off the road.

The purpose of the feeding grounds is to give the park visitor an opportunity to observe bears in safety. Furnish only enough garbage to each feeding ground to attract the bears in during the evening. The bears should be forced to rustle for a portion of their food.

The bears should be discouraged from hibernating under buildings in the park.

Expected results will not be obtained in a single season. This plan in connection with the other methods should show marked progress in bear control work over a period of three seasons. However, it must be remembered that even the wildest of bears will plunder an occasional camp when hungry.

Further reduction: Whether or not the above plan is adopted, further reduction should be exercised. There are numerous bears in the park that know no other means of making a living than by "bumming" the tourists. Many of them are too old to "educate." Some of these bears may have been born under one of the buildings at one of the loop stations. The extent of their travels having been from the housekeeping cabins to the camp ground, thence to the lodge, and back again. Each generation of bears becomes slightly bolder, and when an insufficient amount of food is doled out to them, they obtain it by merely taking it. Closed tents or car windows are no obstacle.

Three bears at the Old Faithful camp ground during the season of 1931 never were observed visiting the feeding ground, although the feeding ground is located

not more than 100 yards from the camp ground.

Make certain which is the offending bear by marking (painting) him and observing him further. Two offenses are sufficient proof that the bear should be taken for a ride (one way) in a bear cage.

At least three more bear cages are desirable. Bear troubles invariably break out all over the park at once. C.C.C. camps in the park have added another source of bear damages. The use of bear cages makes reduction possible with the minimum of publicity. Some times it is possible to dispose of some of the surplus bears to zoological gardens. A few shipping or holding crates should be kept in stock at headquarters for immediate use.

Use of chemicals: Thus far the use of chemicals such as tear gas and etc., have proved unsuccessful. A prepared chemical used for repelling dogs, has been found to be successful to limited degree for repelling bears. The cost of this prepared chemical for general use is prohibitive. Steps are now being made to determine the chemicals used in the manufacture of the repellents. Certain chemical combinations may still prove successful as an aid in bear control work. The doubtful point is, any chemicals that will repel bears will undoubtedly have an obnoxious odor. However, continued experiments are well worthwhile.

Grizzly Bear  
(*Ursus horribilus*)

Present status: Estimated number, about 260. Each year a few of the grizzlies appear to be slightly bolder. Occasionally one is observed, at night, near the outskirts of one of the camps. During the summer season of 1933 a grizzly cub was known to have made frequent visits to the garbage cans in the Old Faithful camp ground.

Recommendations: Although damages caused by grizzlies thus far have been practically unavoidable the problem may become more serious in the future. Any grizzlies that are known to visit any of the inhabited areas or along the road should most certainly be done away with immediately.

Buffalo, Bison  
(*Bison bison* s. sp.)

Present status: The present buffalo herd numbers about 800 animals, with a ratio of almost three bulls to one cow. Due to the difficulty in rounding up bulls last fall this ratio in connection with the reduction program was unavoidable.

The herd in general appears to be in excellent condition. Cows butchered last fall with the exception of the extremely old animals were almost 100% pregnant. Of the 84 buffalo that were branded for future Bang's disease tests in 1933 only eleven animals were corralled during the past round-up. Two of these were butchered before the brands were noticed. The brands on the animals were almost unnoticeable. The staff at the Montana State Veterinary Laboratory, Bozeman, Montana, did not consider that it would be worthwhile to test so few animals. The nine animals that were recognized and saved were run through the squeeze chute and their horns painted. The painted horns are plainly visible at

present and it is believed that this method of marking the animals will prove more satisfactory than branding. Orange paint appears to show up to the best advantage.

Range condition: Little snow fell during the fall of last year. the buffalo remained at high elevations until quite late, many of them did not come down to the ranch until January. Poor winter range in connection with the late and unexpected snowfall has made it necessary to feed longer this spring than was anticipated. Little, if any, hay will be left over in the stacks at the ranch this year. The summer buffalo range is in good condition, but the winter range in the vicinity of the ranch would scarcely support fifty animals.

Recommendations: With the exception of extremely old cows only old bulls and steers should be butchered next season. Steers are usually difficult to round up and have proven to be a nuisance around the herd. Unless there is considerable early snow the annual buffalo round-up in the future should be postponed until the latter part of January or until the majority of the herd is down at the ranch. This will simplify rounding up and will offer an opportunity to size up the whole herd before making a selection for reduction purposes. Future improved road conditions to the ranch will permit winter trucking to the ranch almost any time during the winter.

At next season's round-up further reduction of the herd may appear practicable. Range, hay supply, number and condition of the animals will be the governing factors for basing a decision.

A grazing survey should be made of the new buffalo pasture at Antelope creek before or soon after the show herd is turned in. Yearly surveys should be of the same pasture for two or three more years. This data will give a basis for determining the carrying capacity for the range. One study plot should be built in the pasture to facilitate range study.

In the present condition of the range it is doubtful if the new pasture will support more than 25 or 30 buffalo. It would not be advisable to put more than that number in the pasture at the present time, as certainly care should be taken to see that the pasture is not over-grazed. Twenty-five selected animals will make a satisfactory show herd.

In connection with the show herd it is desirable to select and mark an additional 25 or 30 animals of the type bearing characteristics of *Bison bison harringtoni*. As a suggestion, ten cows and five bulls could be trucked to Nez Perce creek and liberated. A similar number of buffalo could be released in the upper Hayden valley. Quite likely all the animals would cross the Yellowstone river and return to the Buffalo Ranch in the fall, but the experiment is worthy of a trial. There is ample feed both winter and summer at the present time for three times the number of animals recommended. If the plan is successful and remains segregated from the main herd, it will form a nucleus for a future park herd. It also may offer an opportunity for visitors to observe buffalo outside of fenced areas. A successful plan would also relieve the over-populated winter range. A division of herds is always a practical precautionary measure in case of a sudden outbreak of disease.

If practical this spring, the buffalo herd should be corralled and all branded animals segregated and tested for Bang's disease. The horns of the tested animals should be painted before they are released, and similar test should be conducted annually of at least 10% of the herd.

Mule Deer  
(*Odocoileus hemionus hemionus*)

Present status: No attempt was made to count the number of deer in the park this year. The estimated number of deer is about 750. With the exception of those wintering in the Mammoth district the deer in the park appear to be in excellent condition.

The majority of deer around Mammoth are in poor condition. The indirect cause being due to poor winter range conditions. During the past year several deer have died under and around the buildings of Mammoth. In most cases the cause of death was undetermined. In a few cases deer have been known to die of stomach disorders which were caused chiefly by the consumption of a diet of garbage. It might be said that part of the deer around Mammoth are practically domesticated. They are not rustlers and it is doubtful if some of them could be forced to leave Mammoth during the winter months, even if available winter range were plentiful. In movement and general behavior many of these deer are sluggish. They can be forced to run but not with the light springy movement that characterizes a normally healthy deer. It is little wonder that some of them become the victims of coyotes. As the Mammoth winter herd probably consists of the majority of the deer in the park, we have a deer problem that should be carefully considered.

Deer patrols were organized this spring using four members of the local C.C.C. unit. Some results were obtained; at least the deer have become more wary and are not quite as bold in begging for food. However, it did not take the deer very long to learn when the boys stopped work, and they would put in their appearance around the garbage cans within five minutes after the boys quit work. A night patrol would have been added had the C.C.C. camp not been reduced to 39 members just at that time.

A storm period, lasting for about five weeks, resulted in considerable snow late this spring. In comparison to recent normal years at this time, the grass around Mammoth would have had considerable new growth by this time. It was feared that when the storm period did break that the grass would start to grow with increased rapidity, and the sudden change might have severe damaging effects upon the deer herd. The first green grass of spring invariably causes numerous deaths among the elk and deer herds. As an experiment, hay was placed in the Mammoth trapping pen and poles were placed in front of the gate so that the deer might enter, but so the elk could not. Over sixty deer from the vicinity of the Mammoth garbage dump were herded toward the trapping pen. For about a day and a half the deer appeared to enjoy the hay, but after that they lost interest and were observed gathering around the dump again. Feeding was immediately stopped.

The extent to which some of the deer depend upon the garbage for food is exemplified in the following stomach analysis made of a deer that was found dead along side of some garbage cans.

By Volume:

Dry grass . . . . .	55%
Green grass . . . . .	10%
Dry pine needles	8%
Rags . . . . .	12%
Paper . . . . .	5%
Chicken entrails (apparently)	5%
Onion peel and misc. garbage	5%

Range condition: All of the winter deer range is in very poor condition. However the deer wintering outside of the Mammoth vicinity appear to be in far healthier condition in spite of the scarcity of food. Fewer losses of deer are reported from the interior of the park.

The carrying out of the foxtail eradication program will be extremely beneficial to the deer range.

Recommendations: The practice of "taming" and feeding deer in the Mammoth vicinity should most certainly be discouraged. Indoor garbage containers (just installed) should aid materially. Deer patrols should be maintained during the fall, winter, and spring months. Strive to frighten the deer out of Mammoth.

The Mammoth incinerator should be in operation the year around or else all garbage and refuse should be burned or buried.

The Mammoth-Gardiner river vicinity is the natural range for the majority of the deer. If further elk reduction is made it is only logical to make reductions from the Mammoth and Game Ranch trapping pens as much as possible.

If coyote control is limited to certain areas of the park the logical areas for control, and for the benefit of the most game concerned, is the Mammoth and Game Ranch districts.

Continued studies of the diseases of deer should be made with special emphasis on lung worm, deer bot-fly, and the percentage of deaths caused by foxtail, predators, and ticks.

Elk, Wapiti  
(*Cervus canadensis canadensis*)

Present status: It is almost a unanimous belief of all observers who are familiar with the problem that the present elk herd is still in excess of the carrying capacity of the Northern Yellowstone winter elk range.

Reports of findings and methods of handling last winter's elk reduction have been previously submitted and will not be reviewed in this report.

The 1935 elk count of the present herd is as follows:

Gallatin Herd . . . . .	1,140
Northern Yellowstone Elk Herd .	10,112

Range conditions: Mild weather during the winter months resulted in an abnormal amount of available range. By feeding on the higher slopes the elk herds fared very nicely until the middle of March. Severe storm periods followed and continued until April 8. Deep snow fell upon the higher slopes and became heavily crusted. The elk were forced back to the denuded lowlands.

The final results can only be surmised at this time. If the snows, now covering the normal summer range, recede slowly, the elk will be content to remain on the winter range where the first green grass is just beginning to appear. However the snows at the higher elevations should melt quite rapidly once the weather becomes settled. Where the snow has melted on sections of the winter range, the ground is extremely soft. To what extent the trampling by game will damage next season's winter range crop can only be estimated, but certainly it will not benefit the range.

At present the procuring of any quantity of additional winter range through the marginal land program does not look very hopeful.

Losses in the herds at present are beginning to mount up to a considerable figure. The final outcome for the next few weeks depends largely upon the weather conditions.

Recommendations: Further reduction of the Northern Yellowstone Elk Herd is desirable, but to what extent or method to be used depends largely upon the weather conditions for the ensuing eight months and actions taken by the Montana Fish and Game Commission.

Climatic conditions permitting in connection with the herd reduction already exercised, the winter range may be restored to a considerable extent. If the Montana Fish and Game Commission continues to leave the elk hunting season in Park County extended, necessary reduction for next season may be cared for by this method. This problem is important enough to call for the assigning of one ranger, preferably a man who has had training in range work and who has been in the park long enough to be familiar with the problem, to full time elk study. This study should cover the elk and their relationship to the range and the other game animals. With the present limited personnel the assigning of a man to such a project will seriously handicap the organization in properly handling of other important administrative work. Equally important at the present time is to have a basis for figuring the carrying capacity of the winter range.

#### Moose

(*Alces americana shirasi*)

Present status: The moose, of all the game animals in the park, at present constitutes the least problem. Their range has not been too seriously impaired by the other animals, nor do they seriously compete with the other game species. Along the northern portion of the park the scarcity of browse has discouraged the grouping of moose to any extensive number.

The moose on a whole are in excellent condition, and very few deaths have been reported. More moose were observed along road sides last season than ever before. The average tourist receives as great a thrill from observing these majestic animals as they do from seeing their first bear. The estimate

of the number of moose in the park at present is 750. Control measures appear unnecessary at present.

Range conditions: At present there is sufficient, but not an abundance, of range for the moose. The general range covers numerous and widely separated areas, including the vicinities of Blacktail, Gardiner river, Tower Falls, Soda Butte, the Lamar river drainage, Tower Falls, Canyon, Lake, Snake river, and West Yellowstone; with the largest concentrated groups at Thorefare, Beehler, and Willow Park-Swan Lake Flats regions.

Moose are good rustlers and are fairly capable of taking care of themselves during storm periods. During the winter months, if competition with other game animals becomes too great or general food and browse supply becomes scarce, they will usually move to a new area before their browse supply reaches a point of depletion. Deep snows in many cases will not materially impede their migration. Moose have been known to migrate (in the Beehler river district) to new areas through five feet or more of loose or packed snow.

Recommendations: Moose studies should be continued as far as time and personnel will permit, but this study should not be made at the sacrifice of some other more important game problem.

Bighorn, Sheep  
(*Ovis canadensis canadensis*)

Present status: With the range in poor condition last fall it was feared that the bighorn sheep might have some difficulty in wintering. However the greater majority of the bighorn sheep observed this spring appear in excellent condition.

Dr. H. B. Mills, Assistant Park Naturalist, E.C.W., who has spent considerable time during the past seven months in studying the bighorn sheep has made excellent progress in a study of the problem. Due to numerous but unavoidable interruptions, consecutive, systematic observations were necessarily limited to the Gardiner river-Mt. Everts herd. Dr. H. B. Mills has already presented his preliminary report; it will not be reviewed in this report.

Range condition: The winter bighorn sheep range is in very poor condition. Various stages of erosion are more noticeable on this range than almost anywhere else in the park. Of course a certain amount of erosion is expected in lands of precipitous topography, but most of the erosion is due to the general denuded condition of the range. The summer range, although far from normal, still affords sufficient forage for the bighorn sheep.

Recommendations: It is equally important that the bighorn sheep herds be closely observed during the spring, summer, and fall months as well as during the winter months. To do this thoroughly at least two wildlife technicians (E.C.W.) should be assigned solely to the bighorn sheep problem. Many parts of the park now inhabited by bighorn sheep either in summer or winter (in some places the year around) have probably not been visited to any great extent by rangers in recent years.

During the recent elk count by plane, April 14 to 18, bighorn sheep were observed in the approximate locations of Mt. Everts and the Turkey Pen

north of the Yellowstone river west of Cottonwood creek, on the north slopes of Mt. Norris, two bunches on the south slopes of Bison peak, south slope of Agate creek, on Little Specimen, and one bighorn sheep was observed on the south slope of Quadrant Mountain. These were reported by Rush, Elliott, and Childs. No particular attempt was made to observe for bighorn sheep and only a small portion of the park was covered. This emphasizes the fact that we do not know the extent of the range or the number of bighorn sheep now in the park.

As is the case with some of the other animals of the park the relative tameness of many of the bighorn sheep results in losses in the flocks. The trusting bighorns, as are found along the road at the Gardiner river in the winter, are ready victims for poachers once they cross the park boundaries. As for example, nine sheep were killed supposedly for the meat north of the park line this last winter. None of the violators were apprehended and probably numerous more bighorn sheep have disappeared via the same route. Just what practical method could be exercised for "spooking" these animals is difficult to suggest, but most certainly they should never be fed along the roadsides. This unusual tameness during the winter months is probably due to the practice of feeding hay to the bighorn sheep along the roads in years past. Not all the bighorn sheep of the park are as tame as most of the Mt. Everts herd.

#### Range Condition

Present status: Everyone who has made a study of the winter game range of the park agrees that it is severely over-grazed. Trees and various shrubs have been browsed until many of them have been killed out. The aspen are rapidly diminishing. Sheet and even gully erosion becomes more in evidence each year.

Recommendations: A systematic grazing survey should be made of all the winter range. This survey should be conducted by parties experienced in grazing work. In connection with this, several experimental pastures are highly desirable for carrying out the full plan. The steps for determining carrying capacity are:

1. Palatabilities: By observation.
2. Range survey to determine forage acre.
3. Control pasture for figuring forage-acre allowance.
4. Carrying capacity of range.

The present number of study plots are of sufficient number for giving a fair cross section for range study. However a portion of these established plots or a portion within a few of these plots should be fenced with close mesh woven wire into the ground to exclude all mammals. For after all our problem includes all wildlife that affects the range. Meter quadrats have not been set up or read in any of the newly established study plots as yet. Because of the summer rush and the limited personnel it is suggested that these plots be checked photographically. This system has been successfully adopted for range study, and has two advantages in being speedier and furnishes a visible record that anyone can understand. The proper procedure for checking study plots photographically can probably be obtained from Dr. H. C.

Hansen, North Dakota Agricultural College. A few additional study plots might well be used for differentiated study.

Erosion study plots: Locating a study plot on an area that is completely denuded or denude it completely by mechanical means to determine how rapidly the range will recover. Such plots should be arranged alternately on north and south slopes.

Successive-stage plots: The building of additional sections to existing study plots annually for noting the annual succession of growth in relation to the annual precipitation. This method is especially recommended for browse study plots such as aspen groves.

#### Rodents and other Small Mammals

Practically no systematic study or census has been made of the smaller mammals of the park and little can be suggested for their present management. The balance between species appears to have been fairly well maintained for the past years. A change in the past policies of coyote control would probably have varying results.

The write is of the opinion that mountain beaver are present in the section of Broad creek between White and Tern lakes. Further investigations are recommended.

#### Birds

General: Probably more concentrated study has been made of fish-eating birds and of the trumpeter swans than of other bird species of the park. Further study of all bird life of the park is desirable as time and opportunity will permit.

Trumpeter swan: Considerable progress has been made in the study of swan in the park and adjacent territories. Most certainly the swan studies should be continued.

The work of the Wildlife Division in "advertised protection" of the swan has left its impression on the people living in localities where swan are known to frequent. Pictures that have been sent to the various hunting clubs, stores, etc., are proudly displayed and the people have taken a deep interest in protecting these birds. However, it is surprising how few people, even among hunters who visit areas inhabited by swan only during the hunting season, actually knew what a swan looks like or has any idea of the relative size of the bird. The pictures have helped materially toward the protection of the swan, but if a picture showing the swan along with some of the better known waterfowl, such as a Canadian goose and a mallard duck, could be posted at important points, it would help considerably in a more definite identification of the swan.

Every effort should be made to prevent disturbing the swan in any way during the nesting period and until the cygnets have obtained considerable growth. Another attempt will be made this summer to construct artificial experimental islands on Fern and Heart Lakes. Plans for the islands have been submitted and it is intended that work should be started as early this spring as possible so as to gauge the necessary height of the islands during the maximum high water line of the lakes.

Pelicans: Several specimens of pelicans were procured last season for parasitological study. It is advisable to continue these studies by taking one or two specimens each month.

Last season four trips were made to Molly Island for the purpose of counting the pelicans, nests, banding the young, and obtaining specimens for study. The results of these trips are summarized as follows:

<u>Date</u>	<u>Adult Pelicans</u>	<u>Nests</u>	<u>Eggs</u>	<u>Young</u>	<u>Young Banded</u>
5-17-34	250 (est.)	141	191	0	0
6-24-34	300 "	20 (left)	---	159	133
7-7-34	---	---		8 just hatched	20
7-24-34	---	1 (left)	2	8 "	0

California Sea Gulls: Specimens for parasitological study were taken from time to time throughout the season. Following is a summarized count of birds, eggs, and nests:

<u>Date</u>	<u>Adults</u>	<u>Nests</u>	<u>Eggs</u>	<u>Young</u>
5-17-34	1200 (est.)	not counted	--	0
5-29-34	1400 "	637	1516	0
6-24-34	---	0	all hatched	could not be counted

Cormorants: More cormorants were observed last season than ever before reported. None was banded because on each visit some of the eggs were just hatching.

<u>Date</u>	<u>Adults</u>	<u>Nests</u>	<u>Eggs</u>	<u>Young</u>
5-29-34	not counted	4	8	0
6-24-34	" "	19	not counted	one nest hatching
7-7-34	" "	22 additional	--	16
7-24-34	" "	6	--	not counted

Mergansers: Only a few mergansers of various species were taken during the summer for study purposes. Several young birds were taken in the fall of the year. It is no simple matter to obtain specimens as these birds are quite wary. Usually when one was observed it was near a populated area where it could not be killed. The park is in need of a shotgun for procuring bird specimens.

Ravens: These birds are quite abundant and it is thought that they do considerable harm to birds and young, and have been observed destroying the eggs of a swan nest in the park. Ravens, although comprising a portion of the wildlife of the park, should be controlled. They are abundant in other localities and there is little danger of their extermination. In connection with this, a study should be made to determine what parasites, if any, are carried by the ravens. There is a possibility that Diphyllobothrium sp. may be found in the intestines of ravens.

#### Predatory Animal Control

For several years past the rangers in connection with their other duties have controlled the number of coyotes throughout the park. The actual number of coyotes within the park can only be surmised, and it would be foolish to even hazard an estimate of present number.

Thus far it might be said we have made a study of coyote control from one angle only, namely continued control. It would appear, in consideration of the depleted winter range and our reduction program, that coyote control could be suspended for a period of at least two years, and the results could be carefully observed. Perhaps we may find that it is more beneficial to the range and general wildlife balance to suspend coyote control permanently. It may be found that that coyote control will have to be exercised in certain districts of the park such as the Game Ranch, Mammoth, and Tower Falls; in the districts where antelope, deer, bighorn sheep are common.

It is reasonable to believe that the suspension of coyote control will be beneficial to the elk herds. The coyote will destroy the old, sick, and weakened animals first.

A surplus of rodents over the winter range are damaging the already weakened range to some extent. A suspension of control may show some reduction in rodents over a period of years, but it is doubtful if they will be noticeable over a two year trial period.

There is very little danger of the coyotes becoming out of control if carefully observed. The majority of the coyotes range the borders of the park, and a percentage of coyotes will be trapped or shot in the territories adjacent to the park. If an emergency should arise that would call for an immediate reduction of a considerable number of coyotes, certainly arrangements could be made for a reduction by the rangers of the park or the employing of government hunters.

At present an analysis of the coyote stomachs obtained during the past season is not available. This information should furnish a basis for determining the practicability or need of future control. Even if the control of coyotes is suspended specimens should be taken each month for stomach analysis.

#### Salting and Salting Grounds

Present status: Consistent follow-up of a salting program in Yellowstone National Park has never been exercised. Studies of results to-date strengthens the belief that the park game, and especially the elk, are in need of a supplementary salt supply in addition to the natural supply. For example, last summer several sacks of crystal salt were being packed into a salting ground. While enroute the pack horse became unruly and managed to unload the salt. The sacks were not broken but some of the fine salt sifted through the sacks onto the ground. The observer, passing by the same spot about a week later found that the elk had pawed and eaten the soil to a depth of eight or ten inches where the salt sacks had fallen to the ground. Such action certainly indicates the need of a supplementary salt supply.

The past year's administrative program in the park seriously interfered with our salting program. The numerous additional projects and heavy tourist travel in connection with last season's limited personnel made it impossible for the district rangers to spend much time in the field except for fire control duty or the inspection of E.G.W. projects. Some of the salting grounds were neglected or attended irregularly. Most of the rangers were assigned to new districts last summer, and were so rushed with work that in a few instances some of the salting grounds were not even located. The ranger assigned to wildlife work, because of other more pressing duties, was perhaps somewhat

neglectful in attending to the salting program during the summer. Salting was suspended during the fall and winter months for fear it would tend to hold the elk within the park. This would have defeated our purpose of forcing the elk out of the park in connection with our reduction program. The U. S. Forest Service used about 1000 pounds of salt on the range north of the park's winter game range, and it was to our advantage this spring to continue suspension of salting in most areas on the northern portion of the park in order to continue forcing the elk out of the park, thus aiding in relief of the Northern Winter Elk range. At Gallatin a systematic salting program was carried on during the year.

Need of Supplementary Salt Supply for Game: A general analysis of the salting of stock also indicates the importance of salt for game animals. From "In Dairy Cattle and Milk Production," Ekles, 1924, MacMillan, to quote:

"All animals that consume large quantities of vegetable food require salt . . . . "According to Bunge the cause of this salt requirement by herbivorous animals is the large amount of potassium which they consume with the plant food. The potassium is excreted through the kidneys, but while it is in the body a reaction takes place between the potassium and sodium chloride (or common salt), and the resulting compounds are excreted from the body. This leaves the body short in the amount of sodium chloride needed, and results in the well known craving for salt (or sodium chloride)."

Several Agricultural Colleges have made experiments with domestic stock, especially with cattle, of withholding salt from the diet. The animals lost flesh, and vitality, became rough coated, and finally a complete breakdown of the animal resulted. We do not know how much salt is required in the normal diet of game animals. Thus it is all the more important that we make a study of this problem and its requirements. Analysis made of available forage plants of the park reveals a very low percentage of available chlorides. There is little reason to believe that the game, compared to the food utilized in a ratio with the weight of the animals, should require a very much lower percentage of salt than domestic cattle. Mr. W. M. Rush in his report "Northern Yellowstone Elk Study," states:

"An analysis of the water from natural elk licks show from 4.95 to 10.22 parts per million of salt. The artificial salt requirement per day for a domestic range cow is about one and one-third ounces on comparable mountain ranges. An animal to get this amount of salt from a natural lick such as are in the park would have to drink in excess of 1000 gallons of water per day from the best licks and more than 2000 gallons per day from the poorer licks. Thus it is obvious that the natural licks cannot be depended upon to supply the necessary salt for a grazing animal in this region."

It is quite probable that the present existing natural salt licks are not the original licks used by game before this region was inhabited by man. The lack of natural adequate salt licks in the park may account for so little game being reported by the early park explorers, even though they reported an abundance of forage.

The existing natural salt licks of the park are usually boggy depressions devoid of all vegetation for some distance around, heavily trampled by the milling of game, and swarming with flies during the summer season. It is doubtful if there are worse points of infection in the park.

To what extent an adequate salting program need be carried out for best results in Yellowstone park can be largely determined through experimental effort and close observation.

Salting for Migration Control and Distribution: It is believed that a systematic arrangement of salting grounds throughout the park will aid more in controlling migration and distribution than any other single or combination of methods. A few salting grounds in some of the meadows along the highways will attract game so as to be observed by the summer visitors. In 1929 only very rarely were moose ever observed in Willow Park. Last season moose could be observed there every single day during the season. As many as eleven moose were observed at one time, and drawn there, undoubtedly because of the salting ground that had been placed there three years ago.

Present Recommendations: It was decided that portable salting troughs, built at headquarters and packed to the location sites would be more practical and economical than the building of same in the field. Plans have been submitted for building the salting troughs under an E.C.W. wildlife project. The troughs are so designed that they can be used for feeding either block or crystal salt. It will also be possible to insert wooden blocks in the troughs for treating the game for disease such as controlling deer bot-fly larvae infestation. Salting grounds should be located on a slight raise of ground where direct drainage is away from water supplies. The salting troughs should be widely spaced to prevent single animals from commanding the whole ground; rarely will it be necessary to place more than two troughs at any one site. Metal number plates will be attached to the ends of the troughs and not on posts near the salting grounds. It was found that in most cases the game knocked the signs down and where signs are visible from the road, tourists will invariably leave their cars to read the sign . . . perhaps, more quickly than they will read the signs along the road. An explicit and detail record of location and history of each salting ground will be kept in the office. This is important so that each salting ground can be readily located. It is believed for best results the salting program for the entire park should be handled by the men assigned to wildlife work. Salting could be handled more systematically and at times when salting of the various locations is most important. However, the carrying on of a complete and systematic salting program for the whole park is no small chore and will require about 25% of one man's time to properly carry out such a program.

#### Miscellaneous

Various bits of information and scientific datum relative to wildlife were recorded during the past year. Although much of it may appear unimportant at the time, it may furnish exactly the information that will be needed at some later date.

An attempt was made to record all dead game animals reported with notes on cause of death and examinations made. The making of a thorough examination of all animals found dead or that had to be killed proved to be too great a

task. For this report only the species and number of deaths will be listed.

Bear . . . . .	12	(One a grizzly cub)
Deer . . . . .	17	
Elk . . . . .	350	(Reduction not included)
Moose . . . . .	3	
Bighorn sheep	7	(Kill by poachers outside of park not included)
Antelope . . . . .	6	
Buffalo . . . . .	3	(Reduction not included)

Numerous animals are severely injured or killed by cars each season. Undoubtedly many of the injured animals are never reported or found. During the past year the following game animals were known to have been killed, or injured so severely that they had to be killed, by cars or trucks (these were included in above table).

Moose . . . . .	1
Bear . . . . .	3
Elk . . . . .	8
Deer . . . . .	7
Antelope . . . . .	1

#### Conclusion

Wildlife work is no longer based on generalities. We have reached a stage where everything is specialization. Nor is specialization limited to wildlife work alone; it applies to all phases of work in the park. The rangers of Yellowstone National Park are called upon to be specialists in many subjects, but it might be said that this has reached the "saturation point." With our limited personnel and under present conditions, each park ranger has his hands full if he properly attends to all immediate duties pertaining to protection. The proposal of additional work projects means that all work will have to be done in more or less of a sketchy manner or else some phases of the work will necessarily be neglected for the benefit of other work projects. The answer to any additional work suggestions is additional assistance or more qualified rangers.

The wildlife problems of Yellowstone National Park are of sufficient importance to justify the services of several additional men, organized as a separate unit, but working under the supervision of the Chief Ranger. This does not mean that three or four men from the protection department could be assigned to wildlife work. It is not as simple as that. The present protection department force is already handling more administrative work than time for proper supervision will permit. The assignment to wildlife work should call for the creating of new positions over the present existing positions. Each and every ranger can and should report all datum relative to wildlife that is observed, but to call for detail reports from each district ranger as was outlined last winter is not fair to the individual nor in justice to the Service. It must be remembered that in most cases the ranger must make his wildlife observations in connection with his other duties which primarily is protection. The duties under the status of protection are numerous and varied throughout the year, but all are vitally important. Herein are outlined some of the duties, in relative importance, of the park rangers throughout the year. From this it may be judged as to how much time rangers can conscientiously spend in wildlife studies.

1. Summer duties:

- A. Fires, forestry.
  - a. Forest fires.
  - b. Inspection and fire control, utility bldg., and etc.
  - c. Selection and marking timber, fire wood, and construction
- B. Protection of natural resources.
  - a. Defacing formation.
  - b. Picking flowers.
  - c. Cutting or defacing live trees along highways.
  - d. The collecting of specimens without permit.
- C. Attending the public.
  - a. General information.
  - b. Special parties.
  - c. Complaints.
  - d. Accidents.
  - e. Speeding.
  - f. Lost and found articles.
  - g. Bear damages and control.
  - h. Selling of permits (cotes).
  - i. Feeding grounds and bear guard.
  - j. Thefts.
  - k. Disorderly conduct.
  - l. Telegrams and telephone calls.
  - m. Checking of cars, camp ground, lodge, and etc.
  - n. Traffic management, congested areas, parkings.
  - o. Lecturing (occasionally.)
- D. Public Utilities.
  - a. Sanitation.
  - b. Rates and overcharges.
  - c. Building operations (Part Police).
  - d. Thefts.

During the summer numerous other innumerable problems are constantly coming up. The district ranger must be on duty and available day or night. The majority of the above outlined duties call for separate written reports of actions taken.

2. Winter (including early spring and late fall).

- A. Patrols.
  - a. Hunting season. (The majority of the park rangers are deputy game warden to adjacent states. Daily patrols are made during the hunting season. Hunting seasons for three different states must be taken into consideration, extending over a period from September 1 to March 1.)
  - b. Winter patrols. (These are not necessarily to make on skis, snowshoes, or barefoot depending upon location and weather conditions.)
  - c. Telephone line maintenance.
  - d. To shovel snow from utility and government buildings.
- B. Snowshoe cabins.
  - a. Restocking.
  - b. Food supply for winter.
- C. Stations.
  - a. Variety of supplies to last the entire season.
  - b. Food supply for winter.

- c. Equipment, snowshoes, skis and etc.
- D. Horses.
  - a. Bringing to headquarters from interior of park.
  - b. Hay supply to cabins and stations where horses can be kept.
  - c. Feeding and attending of horse herd that is not in use.
- E. Buffalo.
  - a. Assisting with round-ups.
  - b. Butchering and etc.
- F. Miscellaneous.
  - a. Reports.
  - b. Inventories and repair of fire equipment.
  - c. " " " " station and snowshoe equipment.
  - d. Plans and preparations for coming season.

Even the matter of mailing reports must be taken into consideration. In one case it requires eight days travel on skis to make the round trip for mail. Rangers must take their vacation, if any, during the winter. This calls for frequent temporary transfers of personnel between different stations in order that routine duties may be carried on.

Certainly it can readily be seen how little time is left for the ranger to make a thorough study of range conditions and the status of all wildlife within his district boundaries.

If wildlife work in Yellowstone National Park is to be carried on with a definite objective in view, more assistance must be had. Additional positions should be created, and the men filling these positions should be responsible for protection duty only where wildlife is affected.

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