

NESTING STATUS AND FOOD OF THE GOLDEN EAGLE IN  
NORTHERN COLORADO

has been approved for the

by

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D'Ostilio, Dominick Orlando (M.A., Biology: Zoology)  
Nesting Status and Food of the Golden Eagle in Northern  
Colorado

Thesis directed by Professor Hugo S. Rodeck

This Thesis for the M.A. degree by

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Dominick Orlando D'Ostilio  
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Hugo S. Rodeck

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Edwin S. Alexander

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D'Ostilio, Dominick Orlando (M.A., Biology: Zoology) Form and  
Nesting Status and Food of the Golden Eagle in Northern  
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Thesis directed by Professor Hugo G. Rodeck

*Instructor in charge of dissertation*

The nesting sites of fifteen pairs of Golden Eagles were investigated in an area about fifteen miles wide and eighty miles long in the eastern foothills of northern Colorado. In 1943 thirteen of these pairs were known to be nesting, and it was believed that the population of the birds had not changed much in over fifty years. However, in 1954 only six pairs of birds were found to be nesting; it is possible that a seventh pair also nested. The results clearly indicate that the nesting of the Golden Eagle has been reduced by half in the past eleven years.

A food count made on five of the nests showed that the major portion of the diet of these birds consists of mammals, a conclusion reached by other observers who have studied these birds. However, other studies have shown that the Jack Rabbit is most frequently taken by eagles, while the present count shows that Cottontails made up 58.5% of the animals counted. Other animals taken by the foothills-nesting eagles are: Jack Rabbit, Prairie Dog, Black-tailed Deer, Fox Squirrel, Muskrat, Striped Ground Squirrel, Pheasant, Magpie, Mallard, Downy Woodpecker, and Horned Owl.

This abstract of about 250 words is approved as to form and content. I recommend its publication.

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Signed Hugo J. Rodeck  
Instructor in charge of dissertation . . . . . 2

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Area Studied:

## INTRODUCTION

## Preface

A nesting site of the Golden Eagle, Aquila chrysaetos canadensis (Linnaeus), located on a butte twelve miles north of the town of Wellington, Colorado, was visited late in 1951. At the time a note was made concerning the pile of bones which was found at the base of the nests. In February, 1952, these bones were collected for identification. This was the first nesting site of Golden Eagles visited by the writer, and because it yielded a relatively large amount of material it was decided that a food habit study might be made by identifying the material found below the nests of these birds.

During the year other nesting sites of Golden Eagles were visited in the foothills and on the plains east of the Wellington site. However, the Wellington site turned out to be unique in that it was the only one in which an abundance of material was found. The material found at the base of other nests in other localities was very sparse, and in most nesting sites no material at all remained which could be identified. It became evident that in order to make an accurate count of the food species taken it would be necessary to identify food items on the nest itself during the nesting season. This work was carried on in 1954.



## Review Of The Literature

### Area Studied:

The area studied was a strip of land about fifteen miles wide extending from the town of Golden, Colorado, north to the Wyoming boundary. In this region of the state, the western margin of the plains meets the eastern foothills at about 6,000 feet above sea level. This juncture of terrains is a sharp one forming a demarcation about eighty miles long, lying in a north-south direction. The line turns slightly eastward at the Wyoming boundary, but it recedes to the west within that state.

To the west of this line, the Rocky Mountains rise to elevations of 11,000 feet above sea level with numerous peaks over 13,000 feet. The higher elevations have an arctic flora, while the slopes and foothills are predominantly forested by evergreen trees. East of the foothills, the plains drop gradually from 6,000 feet to below 4,500 feet above sea level at the Colorado-Nebraska boundary one hundred and fifty miles away. Numerous buttes and escarpments are found on the plains paralleling the Wyoming boundary. Grasses, cacti, and yucca characterize the vegetation of the plains, with willows and poplars limited to the river banks.

Nests of the Golden Eagle are found both on the plains and in the foothills. They are usually placed in isolated spots on vertical cliffs which afford protection from

enemies yet are relatively close to open areas where food can be obtained. However, there have been many instances in which the nests of these birds were known to be at long distances from the birds' food sources. In the area studied, those nests which were being used in 1954 were associated with a good food supply.

Most of the nests investigated in 1954 were those mapped by Malcolm T. Jollie (1943) in his thesis, The Golden Eagle-- Its Life History, Behavior and Ecology. These are foothills nests situated on the first or second ridge westward from the plains. Jollie stated that fifteen pairs of birds were occupying territories along the eighty-mile strip in 1943. Thirteen of these had nested in the two-year period in which his study was made. To these he added two probable pairs of which he was not certain. Pair No. 10 had not nested in ten years. He did not mention whether pair No. 1 on South Table Mountain, south of Golden, Colorado, nested during the time of his study.

In comparing the number of birds observed by him in 1943 with those recorded in the notebooks of Denis Gale (Henderson, undated), Jollie concluded that the population of the Golden Eagles of the area had remained the same. One nest in territory No. 5 had been used for over sixty-five years. Nests of territories Nos. 3, 5, 7, 8, 10, 11, and 12 were also believed to correspond with those noted by Denis Gale.

I have used the nests presented by Jollie and have included the site north of Wellington in the present study. Other nests to the east of Wellington have been found on Simpson Mesa and on the Chalk Bluffs, but they are too far from the mountains to be considered as foothills nests. The present study should indicate what change, if any, has occurred in the nesting of the Golden Eagles of the foothills since 1943.

Mammals limited to the plains:

Mammal species within the area studied comprise those normally found in the Upper Sonoran Zone (3,500 to 6,000 feet above sea level) and in the Transition Zone (6,000 to 8,000 feet above sea level) in northern Colorado (Lewis, 1952; Warren, 1942).

The foothills themselves do not constitute a barrier to mammalian distribution because of the avenues created by rivers and streams. However, the fifteen-mile width of the strip studied approximates the degree of penetration made by the mammals of one zone into the other. Some of the mammals occupy both life zones.

No count of the mammal population was made for the area, but notations made while in the field indicate that the Cottontail and the Prairie Dog are more abundant than all others. Jack Rabbits were frequently seen, and there were a few observations of Marmot and Coyote. Because the area supports a large variety of mammalian species (Table 1), it

(Continued on next page)

was believed that most of them would be represented in the diet of the Golden Eagle.

Mammals dominant in the foothills, but which enter the plains:

\*Mountain Weasel, Mustela frenata nevadensis  
 \*Weasel, Mustela vison

Table 1. Some mammals in the area studied

\*Jay's Ground Squirrel, Callospermophilus lateralis lateralis  
 \*Picket-pin Gopher, Citellus richardsoni elegans

Compiled from: Anthony, 1928; Lewis, 1952; Warren, 1942.

\* designates those mammals whose identification is easily confused with related species.

\*Marten, Martes caurina orizones  
 Red Fox, Vulpes fulva macroura

Mammals limited to the plains:

Opossum, Didelphis virginiana virginiana monti  
 Otter, Lutra canadensis interior  
 Kit Fox, Vulpes velox  
 \*Nebraska Cottontail, Sylvilagus floridanus similis

Mammals dominant on the plains, but which enter the foothills:

Raccoon, Procyon lotor hirtus  
 \*Long-tailed Weasel, Mustela frenata longicauda  
 Black-footed Ferret, Mustela nigripes  
 \*Prairie Spotted Skunk, Mephitis interrupta  
 \*Kennicott's Ground Squirrel, Citellus spilosoma obsoletus  
 \*Striped Ground Squirrel, Citellus tridecemlineatus pallidus  
 Prairie Dog, Cynomys ludovicianus ludovicianus  
 Fox Squirrel, Sciurus niger rufiventer  
 \*Black-tailed Jack Rabbit, Lepus californicus melanotus  
 Pronghorn, Antilocapra americana

Mammals common to the foothills and to the plains:

Rocky Mountain Spotted Skunk, Mephitis tenuis  
 Badger, Taxidea taxus  
 Coyote, Canis latrans  
 Wolf, Canis lupus  
 \*White-tailed Jack Rabbit, Lepus townsendii campanius  
 \*Wyoming Cottontail, Sylvilagus auduboni baileyi  
 Black-tailed Deer, Odocoileus hemionus hemionus

Later Bent (1937) summarized the food of the Golden Eagle from the literature of the past. His summary showed that the eagle will take almost every mammalian form, as well

(Continued on next page)

Table 1 (Continued)

Mammals dominant in the foothills, but which enter the plains:

- \*Mountain Weasel, Mustela frenata nevadensis
- Mink, Mustela vison
- Marmot, Marmota flaviventris luteola
- Say's Ground Squirrel, Callospermophilus lateralis lateralis
- \*Picket-pin Gopher, Citellus richardsoni elegans
- Beaver, Caster canadensis concisor

Mammals limited to the foothills and mountains:

- Marten, Martes caurina origenes
- Red Fox, Vulpes fulva macroura
- Canada Lynx, Lynx canadensis
- Mountain Bobcat, Lynx uinta
- Fremont's Squirrel, Sciurus fremonti fremonti
- Abert's Squirrel, Sciurus aberti ferreus
- Snowshoe Hare, Lepus bairdi bairdi
- \*Rocky Mountain Cottontail, Sylvilagus nuttallii pinetus

Food Of The Golden Eagle:

Most of what is known of the food of the Golden Eagle is

scattered throughout the literature in the form of anecdotal information. However, beginning with A. K. Fisher (1893) an attempt was made to ascertain more specifically what constituted the food of the birds. His study was based on the contents of six stomachs examined. His results indicated that the birds had taken an Abert Squirrel, a rabbit, and two pigs. The feather of a bird was also found, but it was not identified.

Later Bent (1937) summarized the food of the Golden Eagle from the literature of the past. His summary showed that the eagle will take almost every mammalian form, as well

as fish, reptiles, and birds. The most abundant mammals of a locality constitute the major food of the eagle, and these are usually the ground rodents and the rabbits. Larger mammals are occasionally taken, such as deer, antelope, sheep, goats, and calves. Birds taken by the eagle range in size from thrushes and meadowlarks to herons, ducks, turkeys, owls, and hawks. "Snakes and tortoise" are also taken.

Woodgerd (1952), employing the method used by Fisher, examined the contents of fifty-one stomachs of eagles shot in Montana in 1948. His results showed that the Jack Rabbit, Lepus townsendii, constituted the main food item of the eagle. Thirty Jack Rabbits were counted. Other significant animals in the count included: eight Pronghorn, Antilocapra americana; six Meadow Mice, Microtus spp.; four domestic sheep; four Deer Mice, Peromyscus spp.; and three Cottontails, Sylvilagus spp.

A more recent study of the food of eagles was made by Carnie (1954), in California, in which the food count was made at the nests of seventeen pairs of birds nesting between 1947 and 1952. Carnie removed all food items from the nests in order to avoid errors in recount. His results were tabulated according to the number of a food species identified during each month and the percentage of the total they compose. Of 503 items counted, the Jack Rabbit, Lepus californicus, constituted 28.6 per cent of the food. The Ground Squirrel, Citellus beecheyi, was another main food

item making up 26.4 per cent of the animals taken. Other animals making up a major portion of the food were: Black-tailed Deer, Odocoileus hemionus, 12.7 per cent; Striped Skunk, Mephitis mephitis, 3.4 per cent; Yellow-billed Magpie, Pica nuttallii, 5.9 per cent; Gopher Snake, Pituophis catenifer, 5.2 per cent; and Sacramento Perch, Archoplites interruptus, 3.4 per cent.

This work by Carnie showed a great variety of animal species taken by the Golden Eagle. Fifteen species of mammals were counted, sixteen species of birds, three species of snakes, and two kinds of fish. Carnie also stated that the number of animals of any kind found in each nest correlated with their relative abundance around the nesting area. The remains of Black-tailed Deer were found in those nests of an area in which the deer were plentiful. The same was true for squirrels and for rabbits. Fish were found in only two nests, and these were both in the vicinity of a lake.

No information on the food habits of the Golden Eagle in the northern foothills of eastern Colorado is available even though the birds in the area have been previously studied. It was believed that such a study in Colorado might be of significance and that it should show some correlation with the work of Carnie and with that of Woodgerd. I could not have visited the more inaccessible nests.

## Acknowledgements

I am indebted to many persons who have made suggestions and who have given me information which has been used in

Jollie (1943) presented a map on which the locations of this study of eagles in Colorado. I thank Mr. Herbert Dick, former curator in the University of Colorado Museum, for his map which was very useful because it eliminated much time and energy which would otherwise have been required of anyone first bringing to my attention the nesting site north of Wellington. Thanks are due to Mr. C. E. Till, District Game Manager for the Game and Fish Commission, for his letter concerning the location of four nests observed by him in 1952. Thanks are also due to Dr. Richard G. Beidleman of

Nests of those sites which fronted a good road were easy to find. By studying the faces of the cliffs with an 8 x 30 binocular, some could be seen as far as a mile away. These

I am indebted to Dr. Hugo G. Rodeck, Director of the University of Colorado Museum, who has permitted use of the surfaces of the cliffs, and, in most instances, a patch of specimens in the Museum collections. I owe much thanks to Mr. Lowell Swenson, technician in the Museum, for his

Those nests located in the foothills and away from good roads required more time and energy to find. After a whole day's search, one nesting site of pair No. 6 in S27, T3N, R71W near Deadman Gulch could not be found. Another site (S16, T3N, R71W) of the same pair on the North Saint Vrain River showed no evidence of having been used in several years. By the end of 1952, fourteen nests presented by Jollie had been visited.

Most of all, I am grateful to Mr. Victor Favier, student at the University, who accompanied me on most of my field trips and without whose knowledge of rock climbing I could not have visited the more inaccessible nests.

By the end of 1952, fourteen nests presented by Jollie had been visited.



In 1953 my search for eagle nests was directed to the east and along the Wyoming boundary. These were sites

## MATERIALS AND METHODS

situated on the plains and are not included in the present study. At the time

### Locating The Eagle Nests

very old ones near Sand Creek in S20, T12N, R69W. These Jollie (1943) presented a map on which the locations of appeared to have been unoccupied for a very long time; thirty-eight nests of Golden Eagles were designated. This map was very useful because it eliminated much time and useless to eagles. However, a letter from Mr. C. E. Till energy which would otherwise have been required of anyone states that this site was used in 1952. who wished to study the birds in the area. The nest locations presented by Jollie were copied on topographic maps By 1954 a good knowledge of the nesting sites of Golden Eagles had been acquired, and it was decided that a food which were taken into the field.

habit study of the birds could be made. Beginning in April, Nests of those sites which fronted a good road were easy a time of the year when the eggs have already been laid, each to find. By studying the faces of the cliffs with an 8 x 30 nesting site was visited. No plan was formulated with binocular, some could be seen as far as a mile away. These respect to the order in which the nests were to be visited, appeared as dark objects on shelves which interrupt the field trips were scheduled whenever time was available, surfaces of the cliffs, and, in most instances, a patch of whitewash was associated with them.

Those nests located in the foothills and away from good roads required more time and energy to find. After a whole day's search, one nesting site of pair No. 6 in S27, T3N, R71W near Deadman Gulch could not be found. Another site (S16, T3N, R71W) of the same pair on the North Saint Vrain River showed no evidence of having been used in several years. By the end of 1952, fourteen nests presented by Jollie had been visited.

In 1953 my search for eagle nests was directed to the east and along the Wyoming boundary. These were sites situated on the plains and are not included in the present study. At the time, the only foothills nests noted were two very old ones near Sand Creek in S20, T12N, R69W. These appeared to have been unoccupied for a very long time; falling rock from the overhang above had rendered them useless to eagles. However, a letter from Mr. C. E. Till states that this site was used in 1952.

By 1954 a good knowledge of the nesting sites of Golden Eagles had been acquired, and it was decided that a food habit study of the birds could be made. Beginning in April, a time of the year when the eggs have already been laid, each nesting site was visited. No plan was formulated with respect to the order in which the nests were to be visited. Field trips were scheduled whenever time was available.

In most instances, the nest from which a bird has flown is the one in which the eggs are laid. Thus a climb to the nest or a descent down to it to determine the presence of eggs was necessary at those sites where the approach was made which gave no warning to the birds. This was also done at those sites in which no birds were seen. This method of determining nest occupancy added much effort and more time to the search. If the first nest looked into was unoccupied, then alternative nests close to it had to be investigated. Appropriate rock climbing equipment was used in all these investigations so

### Determining Occupied Nests

The nesting territory of the Golden Eagle may include more than one nesting site, and within the nesting site more than one nest is usually constructed. One of the nests is selected for egg-laying by the birds. There seems to be no

regularity as to the manner in which the nests are chosen, and frequently one nest is used more than another in successive years. Occasionally a bird will select a nest which has not been used in a long time (Jollie, 1943). Any alternative nests, close to an occupied one, do not need to be investigated because nesting eagles do not permit another pair within the vicinity.

A great deal of time and effort is required to get into a nest or into an advantageous position in order to determine if eggs have been laid. Much of this effort can be eliminated if a parent bird is seen to leave a nest when it is approached. In most instances, the nest from which a bird has flown is the one in which the eggs are laid. Thus a climb to the nest or a descent down to it to determine the presence of eggs was necessary at those sites where the approach was made which gave no warning to the birds. This was also done at those sites in which no birds were seen. This method of determining nest occupancy added much effort and more time to the search. If the first nest looked into was unoccupied, then alternative nests close to it had to be investigated. Appropriate rock climbing equipment was used in all these investigations so

that a maximum of safety was secured. Traverses along the rocks, and belay points which reduced the hazards of falling were carefully selected. After learning that a nest was occupied, an attempt was made to return to it as often as possible.

One occupied nest (S28, T4N, R70W north of Dowe Pass) could not be entered. Adequate footholds and handholds along the face of the cliff were not found so that a climb from below the nest was not possible. A rappel from the overhang above the nest swung too far out, leaving the climber dangling at least twenty feet away. No material on the nest could be identified from this position.

No attempt was made to get into the nests of pair No. 3 in S24, T1S, R71W on South Boulder Mountain. It was determined from previous experience that too much difficulty would be encountered in the climb to these nests. The three species of the genus Sylvilagus found in the area studied show a great variation in pelage. Specimens of the young of the genus are also very difficult to separate. This difficulty was also found in the study of the skins of the genus Lepus. For these reasons, whenever the skulls of these animals were not present they were counted and listed under the genus only.

A separate count was kept of the food items found in each nest occupied in 1954 in order to ascertain whether any differences exist in the numbers and species taken by the birds at the different sites. They were tabulated according

## Counting And Identifying Food Items

Easily identified food items found on occupied nests were discarded so that they would not be recounted. This was the method employed by Carnie (1954). Specific identification was possible whenever the skulls of the mammals were present. Keys presented by Hall (1951) and by Craig (1929) were used for the identification of the skulls. However, eagles usually decapitate food items before bringing them to the nest (Cameron, 1905) so that in most instances identification had to be made from animal parts of lesser taxonomic value. Those items whose identification could not be made in the field were taken along to be compared with the collections housed in the University of Colorado Museum.

A study of the skins of the Lagomorpha demonstrated that their identification is very difficult when skulls are not present. The three species of the genus Sylvilagus found in the area studied show a great variation in pelage. Specimens of the young of the genus are also very difficult to separate. This difficulty was also found in the study of the skins of the genus Lepus. For these reasons, whenever the skulls of these animals were not present they were counted and listed under the genus only.

A separate count was kept of the food items found in each nest occupied in 1954 in order to ascertain whether any differences exist in the numbers and species taken by the birds at the different sites. They were tabulated according

to the number of individuals of a food species counted at the time the visits were made. Animals collected from the site north of Wellington in 1952 were also included, in a separate list. A total of the items taken from all the nests was also made in order to compare with the results obtained by Carnie.

pair of birds of a territory. These territories are definitely conjectural (Jullie, 1943), but they do serve to illustrate the distribution of the birds within the area studied (Fig. 1). They are used to imply the largest range of an area established by a nesting pair of birds which is defended by them from any intruders. The territories may include a number of favorable cliffs on which nests are constructed. I have referred to these cliffs as nesting sites. I have tried to give the exact location of each site as best as I can determine as well as the number of nests built by the birds at each of them.

I have not given a number to the pair which nested at Round Butte, nor have I given a number to the pair at Sand Creek. An exploration was made for the latter pair in order to determine if other nests had been constructed, but none were found.

## Nesting Sites Of The Golden Eagle

## Nesting Sites Investigated OBSERVATIONS

In the following account of the nests of Golden Eagles I have used the number assigned by Malcolm T. Jollie to each pair of birds of a territory. These territories are used definitely conjectural (Jollie, 1943), but they do serve to illustrate the distribution of the birds within the area studied (Fig. 1). They are used to imply the largest range of an area established by a nesting pair of birds which is defended by them from any intruders. The territories may include a number of favorable cliffs on which nests are constructed. I have referred to these cliffs as nesting sites. I have tried to give the exact location of each site as best as I can determine as well as the number of nests built by the birds at each of them.

I have not given a number to the pair which nested at Round Butte, nor have I given a number to the pair at Sand Creek. An exploration was made for the latter pair in order to determine if other nests had been constructed, but none were found.

One of the residents of Eldorado Springs, Mr. Lawrence E. Burkey, with whom I had a conversation about the nesting of the eagles on South Boulder Mountain, said that adult birds were seen in the vicinity at all times of the year. However, he did not know whether they were nesting. On June 22, 1954, I stationed myself near South Boulder Creek where I could watch two of the nests. On that day I did not see any eagles near the nests. The area has not been disturbed by humans

beings, and Nesting Sites Of The Golden Eagle

Nesting Sites Investigated In 1954:

Pair No. 2 on North Table Mountain north of Golden, Colorado, has one nest which was not used in 1954. It

appears that this site (S16, T3S, R70W) will not be used

again because of human activity within the area. The

mountain has been trapped by persons living near it.

Although I am not certain, I think that the eagles were

trapped and killed previous to 1954.

Pair No. 3 has built three nests on Boulder Mountain

just north of Eldorado Springs, Colorado. Two of the nests

are about a half-mile apart, while the third nest is at least

a mile and a half from them. They are all placed in

inaccessible spots so that a climb to them would be a very

strenuous one. Even after climbing to them they would be

difficult to enter. For this reason the site was not

studied until the status of other nesting eagles was determined

One of the residents of Eldorado Springs, Mr. Lawrence E.

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the eagles on South Boulder Mountain, said that adult birds

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watch two of the nests. On that day I did not see any eagles

near the nests. The area has not been disturbed by human



beings, and I believe that a more careful search might have shown that the birds were nesting. Because there is a minimum of human activity within the nesting site and because the birds have been seen regularly in the vicinity I have assumed that this pair nested in 1954.

Pair No. 4 originally nested on a cliff on Mt. Sanitas (S20, T1N, R71W) near Boulder, Colorado. There are two nests on the cliff, but one of them is almost destroyed. Dr. Norman R. French told me that the site was used in 1951. At that time eggs had been laid, but they were not hatched. No eggs have been laid by the birds at this site since then.

Pair No. 5 has three nesting sites which are all in the forested portions of the foothills. One of the sites is on Fairview Peak (S15, T2N, R71W) and consists of two nests which were not used in 1954. Another nesting site of this pair is on a cliff facing Buckingham Park (S2, T2N, R71W). It has three nests which were not used in 1954. The third site (S21, T2N, R71W) is on a cliff about a mile north of Deer Creek Canyon. Seven nests have been constructed by the birds at this site; one had been in use for over sixty-five years (Jollie, 1943). On April 10, 1954, one of the nests of more recent construction had two eggs in it (Fig. 2). This nest is known to have been used every year since 1951.

The nest was easy to get into. A Ponderosa Pine on top of the cliff was used as a rappel point. After the eggs had

hatched, the young birds were banded (May 18, 1954; No. 498-04661 and No. 498-04662). The nest was visited eleven times in making the food count. The young birds had not left the nest when the last count was made on July 2.

Pair No. 6 has three nesting sites. One site consisting of two nests is on Steamboat Mountain (S12, T3N, R71W) north of Lyons, Colorado. Another site of this pair is on the North Saint Vrain River on a cliff facing Longmont Dam (S16, T3N, R71W). Neither of these sites was used in 1954. Two more nests of this pair were said by Jollie to be situated on a mountain near Deadman Gulch along the South Saint Vrain (S27, T3N, R71W). I was unable to find the nests at this site in 1952 or in 1954, although a whole day was spent in searching for them each year.

Pair No. 7 has two nests situated on a cliff north of Dowe Pass in S26, T4N, R70W (Fig. 3). Two visits were made to this site, and on both occasions an adult bird was seen entering one of the nests. There is no doubt that the nest was occupied. On May 12, 1954, the cliff was climbed, but no way was found which would permit observations to be made on the nest. A rappel from above the nest was not attempted because it would leave the climber dangling too far away for effective observation.

Pair No. 8 has two nesting sites located in the vicinity of Carter Lake. Two nests are on a cliff in S4, T4N, R70W,

and one nest is on a cliff in S11, T4N, R70W. Neither site was used in 1954. These sites are in an area which is being developed in connection with the Colorado-Big Thompson Project, and it appears that the birds will not nest in the area again.

Pair No. 10 originally nested on a cliff facing Loveland Reservoir (S11, T5N, R70W). Jollie stated that this site had not been used for over ten years previous to 1943. The site was visited on April 18, 1954, and I saw no indication that it would be used again by the birds. Another site of this pair (S6, T5N, R70W) was visited on June 13, 1954, and it also was not being used.

Pair No. 11 has three nests about seven miles southwest of Fort Collins, Colorado. On May 8, 1954, an adult bird was seen leaving one of the nests on Horsetooth Mountain (S26, T7N, R70W; Fig. 4). The nest was entered on May 20, and it contained one bird which was banded on that day (No. 498-04663). Four visits were made to this nest in making the food count. On July 3, the young bird flew off the nest just before I entered it.

Pair No. 12 (S25, T9N, R70W) has one nest which was visited on May 12, 1954. No eggs were found in this nest. There were no signs that would suggest why the birds had not laid eggs. A search in the vicinity of this site indicated that no other nests had been constructed by the birds.

No eagles were seen within the territory, and no information was gathered which might explain what has happened to the birds of this territory.

Pair No. 13 has built four nests on a butte in Owl Canyon in S6, T9N, R69W (Fig. 5). On April 15, 1954, one egg was found in one of the nests. The egg was hatched, and a food count was made for this nest. On June 8 the young bird, not yet ready to leave the nest, was no longer on it. The bird had not been banded. Dr. Richard G. Beidleman told me that the bird had been taken by a member of Colorado A & M College. The nest was visited again on June 20 to find out if the adults might bring food there to be eaten. No food items were found on the nest that day.

Pair No. 14 has three nests which are located in S10, T9N, R70W. On May 8, 1954, an adult bird was seen leaving one of the nests on "Eagle Rock" (Fig. 6). This nest was examined on May 16, and it contained one bird. The bird was banded on June 8 (No. 48-804784). It left the nest on June 26 while I was making a food count. Six visits were made to this nest in counting the food.

Pair No. 15 has constructed two nests on a butte in S13, T10N, R70W. According to Mr. C. E. Till, this site was used in 1952. However, no eggs were laid by the birds of the site in 1954. A waitress at the Forks Cafe revealed that two birds had been caught near this site in 1953 by neighborhood boys.

The Sand Creek Site consists of two nests in S20, T12N, R69W. Both nests have been destroyed by rocks which have fallen from the overhang above them. Mr. C. E. Till stated that this site was also used in 1952. To my knowledge it has not been used since then. An investigation of the general area around the site did not reveal that any new nests were constructed by the birds.

The Round Butte Site (S17, T11N, R68W; Fig. 7) consists of six nests located on a butte about twelve miles north of Wellington, Colorado, and about a mile north of Round Butte, has been used every year since 1951. It is surrounded by plains but is sufficiently close to the foothills to be included with them. In 1952 the bones which had accumulated at the base of the nests were collected and identified. The site was visited in 1953 but no food was counted that year.

Two eaglets were raised at this site in 1954. They were banded on May 23, 1954 (No. 498-04664 and No. 498-04665). Six visits were made to this nest, and the young birds were still on it when the food count was terminated.

Territories of the two probable pairs presented by Jollie (designated by ? on the map, Fig. 1) were explored while making trips to the nests of other birds. I was unable to find any eagle nests in these territories, even though the areas appear to be favorable for the birds.

Nesting Sites Not Investigated in 1954:

Pair No. 1 on South Table Mountain south of Golden, Colorado, has one nest. It was not used by the birds in 1943 (Jollie, 1943). The site was not visited by the writer, and no information was received from other observers concerning the use of the nest by eagles in 1954.

The nesting site of pair No. 9 on Blue Mountain (S27, T4N, R70W) south of Pinewood, Colorado, was not investigated; the owner of the property would not permit me to enter it. Two nests were designated at this site by Jollie. Observations of the possible activity of eagles within the vicinity could not be made, since trees and mountain ridges made such observations unsatisfactory.

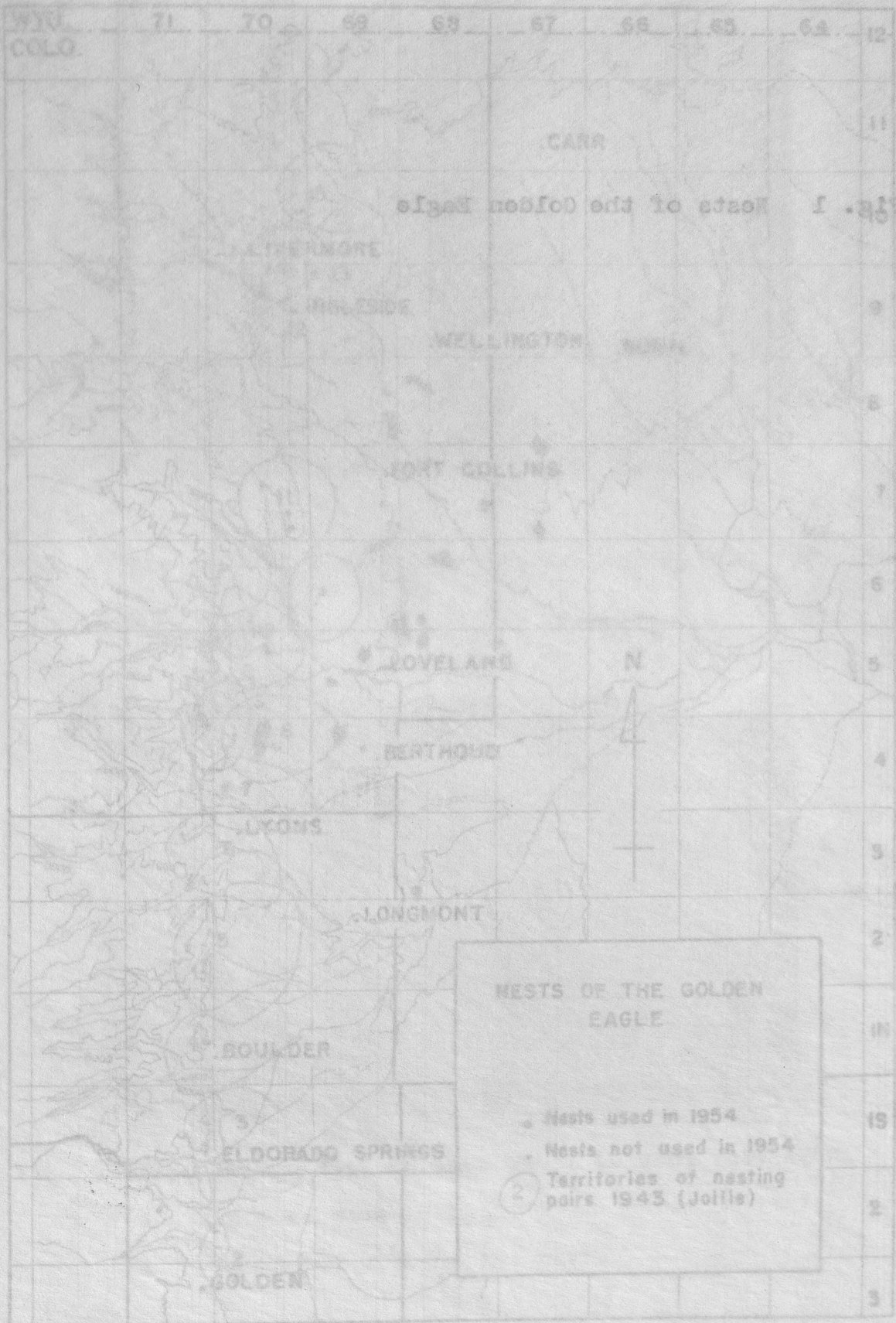
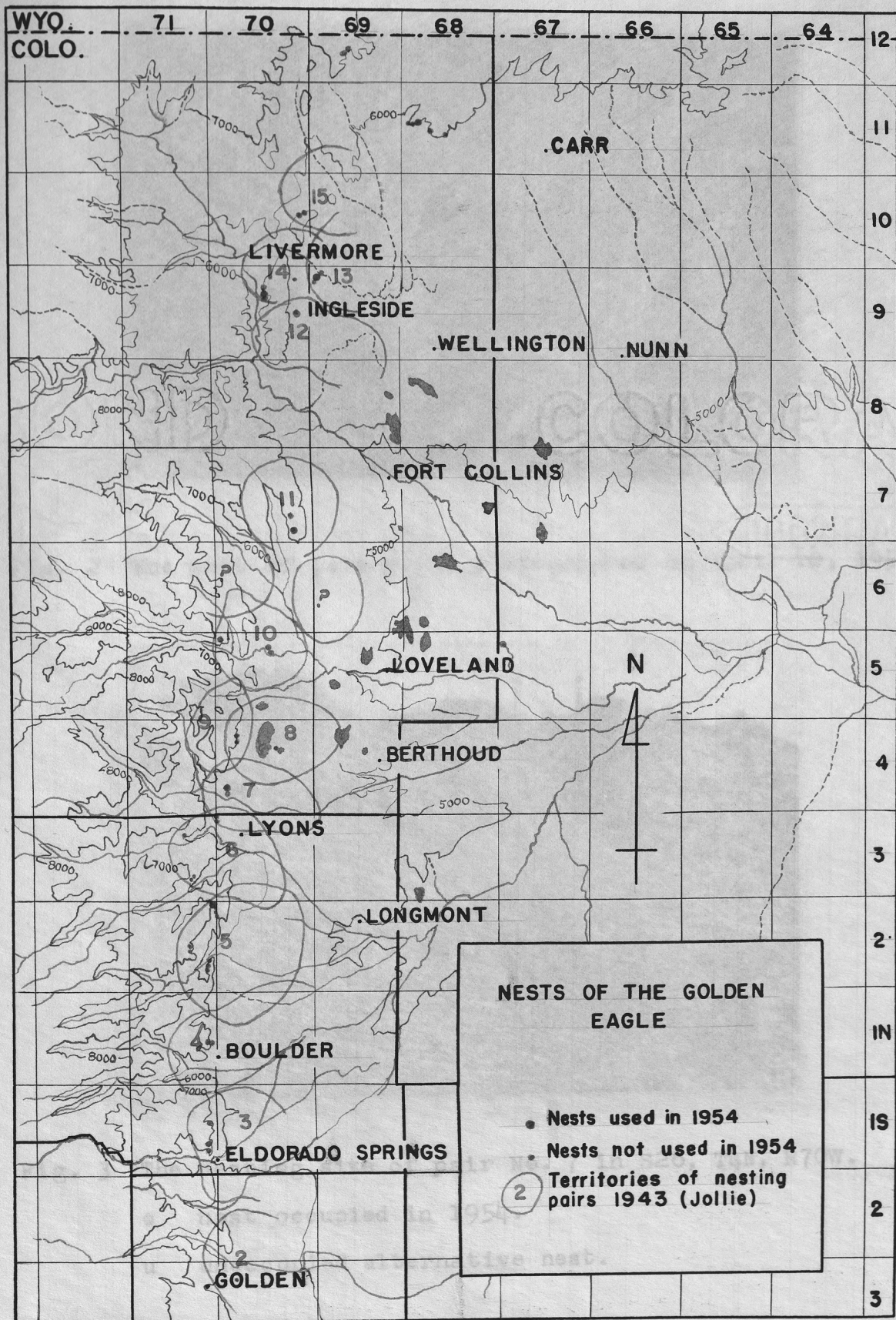


Fig. 1 Nests of the Golden Eagle





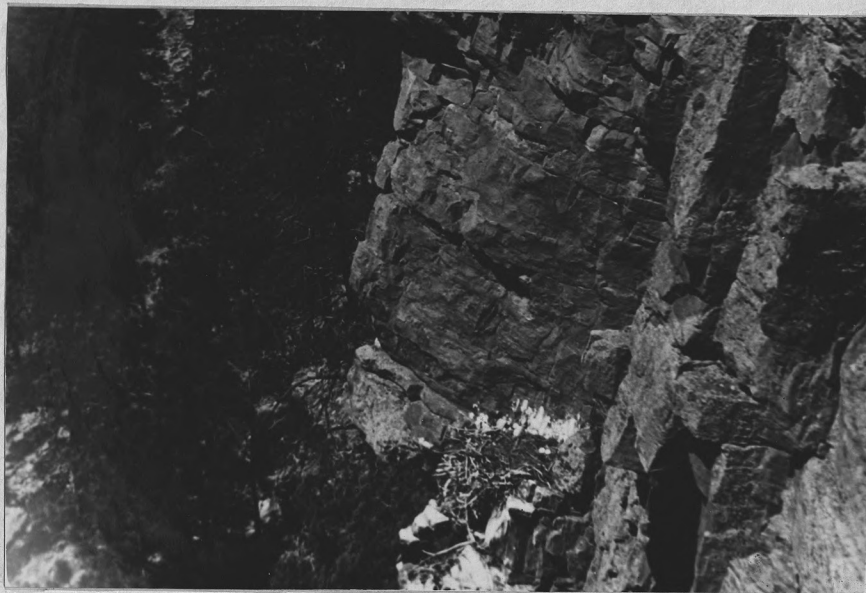


Fig. 2 The nest of pair No. 5 photographed on April 10, 1954.



Fig. 3 The nesting site of pair No. 7 in S26, T4N, R70W.

o nest occupied in 1954.

u unoccupied alternative nest.

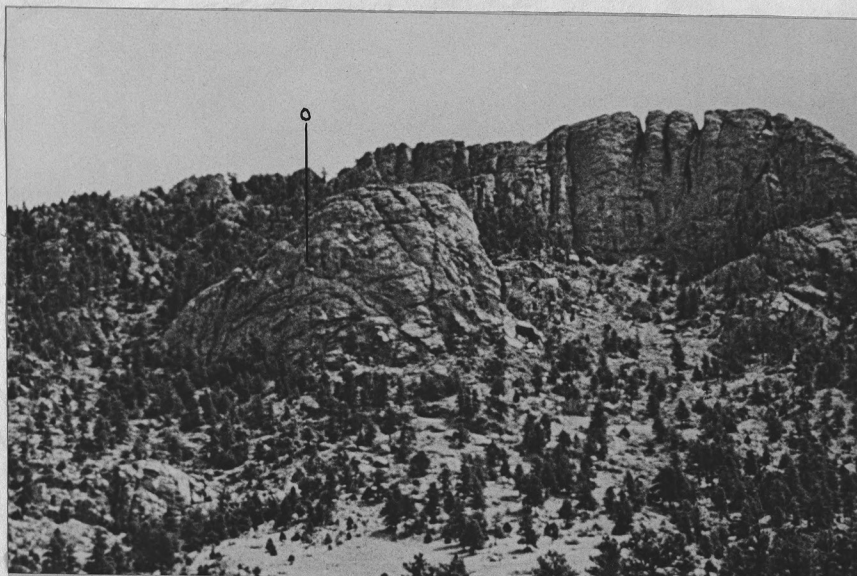


Fig. 4 The nesting site of pair No. 11 on Horsetooth Mountain.  
 o nest occupied in 1954.

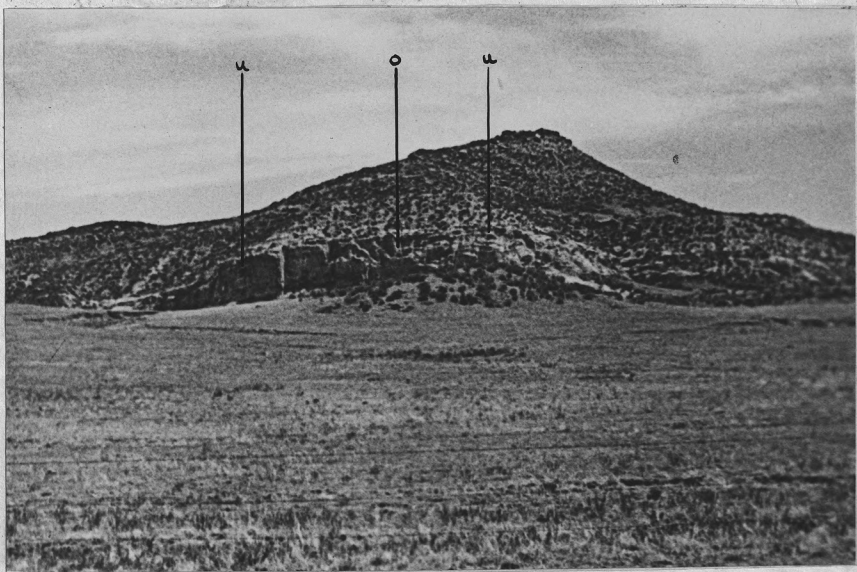


Fig. 5 Nesting site of pair No. 13 on a butte in Owl Canyon.

o nest occupied in 1954.

u unoccupied alternative nest.

u unoccupied alternative nest.



Fig. 6 The nesting site of pair No. 14 in S10, T9N, R70W.

o nest occupied in 1954

u u unoccupied alternative nest.



Fig. 7 The nesting site north of Round Butte.

o nest occupied in 1954.

u u unoccupied alternative nest.

### Condition Of The Food Items

Materials which were collected from the base of the nests at the Round Butte site in 1952 consisted of mammal bones only. These were found in scattered piles below the nests. Tabulations were based on skull identification only, except for the tail of a Kangaroo Rat, Dipodomys ordii, which was found on one of the nests.

Most of the food animals counted on the nests in 1954 had been decapitated by the birds. This is a common practice according to the observations made by persons who have studied the food habits of the Golden Eagle. In the present study, all of the Lagomorpha counted were found decapitated with the exception of one Jack Rabbit, Lepus townsendii, which was identified on the nest of pair No. 5. The fur of the tails of the Lagomorpha were regularly torn off. Whether the birds do this habitually or whether the loss of the fur of the tails of these animals is the result of the loose condition of their skins is not certain. If the tail fur had been intact, it would have been possible to distinguish between Lepus townsendii and Lepus californicus.

All Black-tailed Deer, Odocoileus hemionus, which were counted were fawns (Fig. 8). It appeared that the entire bodies of two of them were brought to the nests and later torn apart. This was the condition of one fawn found on the nest of pair No. 5 as well as of another found on the nest of pair No. 14. The other four fawns counted on the nest of the

latter pair consisted of hind parts only. On June 22, the day that the young bird left the nest, a parent bird was observed bringing in the hind portion of one of these fawns.

The single Ground Squirrel, Citellus tridecemlineatus, was a very young animal. In most of the nests young Cottontails and young Prairie Dogs were also counted, during the month of May (Fig. 9). The Fox Squirrel and the Muskrats (shown in Fig. 10) and the Marmot were all adult-sized animals. The Marmot was identified from the skull and the tail which were found on the nest.

Pheasants had been decapitated before they were brought to the nest. Some of them had been eaten, and identification was made from the legs which remained (Fig. 10). Mallards, both of them males, were found on the nests with the heads knocked off. The identifications of the other birds were made from feathers.

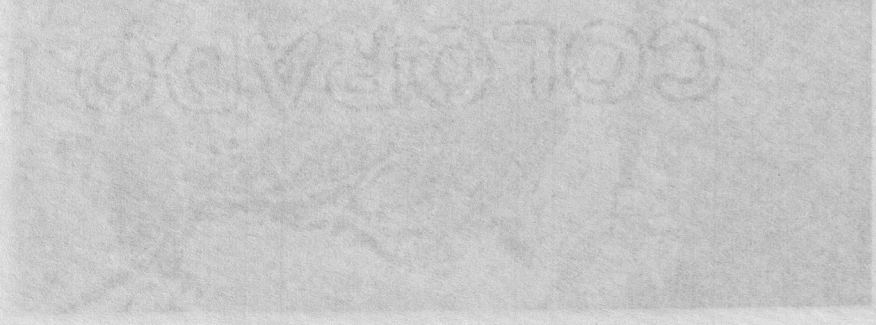


Fig. 9 Young Prairie Dog on the nest of pair No. 5 at a time when the taglets were very small.



Fig. 8 The head of a deer fawn on the nest of pair No. 14,  
June 20, 1954.



Fig. 9 Young Prairie Dog on the nest of pair No. 5 at a  
time when the eaglets were very small.



Fig. 10 Food on the nest of pair No. 13 in Owl Canyon.

A Fox Squirrel, the feet and tail of a Muskrat, and the legs and feet of a Pheasant are seen in the photograph.

On succeeding days fewer numbers were found.

The total number of animals counted in 1954 and the percentage of the total of each are listed in Table 5. Food items recorded by Carnie in California are also included for comparison in Table 8.



Table 2. Results Of The Food Count  
of the nests at Round Butte in 1952.

Food items identified from the bones collected in 1952 at Round Butte are listed in Table 2. They were not included in the total count (Table 8) because they represent food material which had accumulated over a period of years rather than material taken by the birds in one nesting season. The food which was counted from the five nests in 1954 and the dates on which the counts were made are listed in Tables 3, 4, 5, 6 and 7. They represent the food taken by the birds of pairs No. 5, 11, 13, 14, and those of the Round Butte site, respectively. Three of these show that the largest number of individuals were identified on the first day's visit during the count. It is apparent that this is the result of a failure to visit all of the nests within a period shortly after the eggs were hatched. The eaglets are still very small during this period and not able to devour completely all of the food. On succeeding days fewer numbers were found.

The total number of animals counted in 1954 and the percentage of the total of each are listed in Table 8. Food items recorded by Carnie in California are also included for comparison in Table 8.

Table 2. Food identified from skulls collected at the base of the nests at Round Butte in 1952.

	Number of Animals												% of Total	
Prairie Dog, <u>Cynomys ludovicianus</u> . . .													49	74.4
Cottontail, <u>Sylvilagus nuttallii</u> . . .													7	10.6
<u>Sylvilagus auduboni</u> . . . . .													2	3.0
Pronghorn, <u>Antilocapra americana</u> . . .													2	3.0
Jack Rabbit, <u>Lepus townsendii</u> . . . . .													1	1.5
<u>Lepus californicus</u> . . . . .													1	1.5
Coyote, <u>Canis latrans</u> . . . . .													1	1.5
Kit Fox, <u>Vulpes velox</u> . . . . .													1	1.5
Weasel, <u>Mustela frenata</u> . . . . .													1	1.5
Kangaroo Rat, <u>Dipodomys ordii</u> . . . . .													1	1.5
													<u>66</u>	<u>100.0%</u>
Total	3	0	6	3	4	3	1	2	8	2	5	37		

Table 3. Numbers of animals taken in 1954 by pair No. 5 and dates on which they were counted.

	April		May				June			July	Total	
	25	27	5	12	18	25	31	4	19	23	2	
Cottontail, <u>Sylvilagus</u> sp. . . . .												
Magpie, <u>Pica nuttallii</u> . . . . .												
Prairie Dog, <u>Cynomys ludovicianus</u> . . .			2	1	2		1	1	1	1	3	12
Cottontail, <u>Sylvilagus</u> sp. . . . .	2		2			2		1	2	1		10
Pheasant, <u>Phasianus colchicus</u> . . .	1		2	2	2				2		1	10
Jack Rabbit, <u>Lepus</u> sp. . . . .									2		1	3
<u>Lepus townsendii</u> . . . . .						1						1
Black-tailed Deer, <u>Odocoileus hemionus</u> . . .									1			1
Total	3	0	6	3	4	3	1	2	8	2	5	37

Table 4. Numbers of animals taken in 1954 by pair No. 11 and dates on which they were counted.

	May		June	July	Total
	20	30	13	3	
Cottontail <u>Sylvilagus</u> sp. . . . .	2	3			5
Magpie, <u>Pica nuttallii</u> . . . . .	1		1	3	5
Pheasant, <u>Phasianus colchicus</u> . . . . .	1				1
Mallard, <u>Anas platyrhynchos</u> . . . . .		1			1
Horned Owl, <u>Bubo virginianus</u> . . . . .			1		1
Downy Woodpecker, <u>Dryobates pubescens</u> . . . . .				1	1
Total	4	4	2	4	14

Table 5. Numbers of animals taken in 1954 by pair No. 13 and dates on which they were counted.

	May		June		Total				
	8	16	23	30					
Cottontail, <u>Sylvilagus</u> sp. . . . .	11	5	5	3	27				
Fox Squirrel, <u>Sciurus niger</u> . . . . .	2	2		1	5				
Muskrat, <u>Ondatra zibethica</u> . . . . .	3	1			4				
Pheasant, <u>Phasianus colchicus</u> . . . . .	1	2			2				
Prairie Dog, <u>Cynomys ludovicianus</u> . . . . .				1	1				
	Total		16	10	5	5	3	0	39
Pheasant, <u>Phasianus colchicus</u> . . . . .							1		1
Unidentified Bird . . . . .			2						2
	Total		18	9	6	6	4	4	53

Table 6. Numbers of animals taken in 1954 by pair No. 14 and dates on which they were counted.

	May			June			Total
	16	23	30	8	20	26	
Cottontail, <u>Sylvilagus</u> sp. . . . .	15	8	6	6	4	1	40
Black-tailed Deer, <u>Odocoileus hemionus</u> . . . . .	3	2	3	2	2	3	5
Prairie Dog, <u>Cynomys ludovicianus</u> . . . . .			1		2		2
Marmot, <u>Marmota flaviventris</u> . . . . .		1			1		1
Mallard, <u>Anas platyrhynchos</u> . . . . .	12	9	7	7	9	7	51
Pheasant, <u>Phasianus colchicus</u> . . . . .	1				1		1
Unidentified Bird. . . . .	2						2
Total	18	9	6	6	9	4	52

Table 7. Numbers of animals taken in 1954 by Round Butte pair and dates on which they were counted.

	May			June			Total
	13	23	30	6	20	26	
Cottontail, <u>Sylvilagus</u> sp. . . . .	9	7	3	5	6	1	31
Jack Rabbit, <u>Lepus</u> sp. . . . .	3	2	3	2	2	6	18
Prairie Dog, <u>Cynomys ludovicianus</u> . . . .			1				1
Ground Squirrel, <u>Citellus tridecemlineatus</u> .					1		1
Total	12	9	7	7	9	7	51
Phoebe . . . . .							
Black-tailed Deer, <u>Ovis montanus</u> . . . . .							
Fox Squirrel, <u>Sciurus niger</u> . . . . .							
Gray Squirrel, <u>Sciurus californicus</u> . . . . .							
Nutcracker, <u>Callositta californica</u> . . . . .				5	2.5		3.0
Muskrat, <u>Fiber zibethicus</u> . . . . .				4	2.0		
Hallard, <u>Amphispiza bilineata</u> . . . . .				2	1.0		.4
Warbler, <u>Geothlypis trichas</u> . . . . .				1	.5		
Downy Woodpecker, <u>Picopetes pubescens</u> . . . . .				1	.5		
Furred Owl, <u>Nyctaleus californicus</u> . . . . .				1	.5		1.0
Striped Skunk, <u>Mephitis mephitis</u> . . . . .						17	3.0
Woodrat, <u>Neotoma fuscipes</u> . . . . .						4	.8
Gopher Snake, <u>Pituophis catenifer</u> . . . . .						26	5.2
Sacramento Perch, <u>Archoplites interruptus</u> . . . . .						17	3.4
Others . . . . .				2	1.0	51	10.2
Total				193	100.0%	503	100.0%

Table 8. Total numbers of food items recorded from five foothills nests in Colorado in 1954 compared with those recorded by Carnie, in California, from seventeen nests between 1947 and 1952.

	Items counted 1954		Items Carnie 1947-1952	
	Num-ber	%	Num-ber	%
Cottontail, <u>Sylvilagus</u> sp. . . . .	113	58.5		
<u>Sylvilagus auduboni</u> . . . . .			1	.2
Jack Rabbit, <u>Lepus</u> sp. . . . .	21	10.8		
<u>Lepus townsendii</u> . . . . .	1	.5		
<u>Lepus californicus</u> . . . . .			144	28.6
Ground Squirrel, <u>Citellus tridecemlineatus</u> . . .	1	.5		
<u>Citellus beecheyi</u> . . . . .			133	26.4
Prairie Dog, <u>Cynomys ludovicianus</u> . . . . .	16	8.2		
Pheasant, <u>Phasianus colchicus</u> . . . . .	14	7.2		
Black-tailed Deer, <u>Odocoileus hemionus</u> . . . . .	6	3.1	64	12.7
Fox Squirrel, <u>Sciurus niger</u> . . . . .	5	2.5		
Gray Squirrel, <u>Sciurus californicus</u> . . . . .			7	1.4
Magpie, <u>Pica nuttallii</u> . . . . .	5	2.5	30	5.9
Muskrat, <u>Ondatra zibethica</u> . . . . .	4	2.0		
Mallard, <u>Anas platyrhynchos</u> . . . . .	2	1.0	2	.4
Marmot, <u>Marmota flaviventris</u> . . . . .	1	.5		
Downy Woodpecker, <u>Dryobates pubescens</u> . . . . .	1	.5		
Horned Owl, <u>Bubo virginianus</u> . . . . .	1	.5	7	1.4
Striped Skunk, <u>Mephitis mephitis</u> . . . . .			17	3.4
Woodrat, <u>Neotoma fuscipes</u> . . . . .			4	.8
Gopher Snake, <u>Pituophis catenifer</u> . . . . .			26	5.2
Sacramento Perch, <u>Archoplites interruptus</u> . . .			17	3.4
Others . . . . .	2	1.0	51	10.2
Total	193	100.0%	503	100.0%



## CONCLUSIONS

### Nesting Status Of The Golden Eagle

The study conducted in 1954 indicates clearly that the nesting of the Golden Eagle in the northeastern Colorado foothills has been reduced by half in eleven years since 1943. In 1943, thirteen pairs of birds out of fifteen studied by Jollie were nesting along the eighty-mile strip in the foothills. These were pairs No. 2, 3, 4, 5, 6, 7, 8, 9, 11, 12, 13, 14, and 15. At that time Jollie concluded that the nesting population of eagles had not changed in over fifty years. At the time of the present study pairs No. 5, 7, 11, 13, and 14 were the only ones which were definitely found to be nesting, although it is probable that pair No. 3 also nested. I have added two more foothills nesting sites to the original list presented by Jollie; one of these, the Round Butte pair, nested in 1954. These make a total of six pairs nesting, with a probable seventh, out of fifteen pairs studied in 1954. It appears that seven pairs of birds nested in 1954 where thirteen nested in 1943.

Sufficient information concerning the circumstances which have directly discouraged the other pairs of birds from nesting in the area was not gathered. It is certain that one of these, the Sand Creek pair, did not nest because of the destruction of the site by falling rocks. In all

probability the failure of most of these birds to nest is the direct result of the activity of human beings close to the nesting sites. Trapping may have been responsible for the disappearance of pair No. 2, and the capture of eagles by local boys suggests a reason for the failure of pair No. 15 to nest. Other pairs, Nos. 6, 8, and 10, are in areas of major human activity where dams and reservoirs exist or are in the process of construction.

Another cause, not previously mentioned, may be the practice by ranchers of poisoning Prairie Dogs, especially in the region north of Wellington, Colorado. I do not know whether this practice has been carried very close to the nesting sites of the eagles, but the single Prairie Dog taken by the pair at Round Butte in 1954 is in sharp contrast to the forty-nine accumulated in 1952 and indicated that the birds are turning to other items in foraging for food.

Squirrel, *Taxidea tridecemlineatus*. Bird species taken by the foothills-nesting eagles include: Pheasant, *Phasianus colchicus*; Magpie, *Pica nuttallii*; Mallard, *Anas platyrhynchos*; Downy Woodpecker, *Dryobates pubescens*; and Horned Owl, *Bubo virginianus*.

The mammal species taken by the birds in 1954 indicate that the eagles had not foraged far from their nesting sites in searching for food. Of the mammals identified on the nests, all are known to inhabit the foothills.

Food Of The Golden Eagle

Carnie's results (Table 8) show that the Jack Rabbit, Lepus californicus, and the Ground Squirrel, Citellus beecheyi, were the dominant mammals in the diet of the Golden Eagles studied by him in California between 1947 and 1952. Jack Rabbits, Lepus townsendii, made up over half of the food of eagles studied by Woodgerd in Montana in 1952. In the present study the dominant mammal taken by the birds was Cottontail, making up 58.5 per cent of the animals taken. In all probability all three species of Cottontails living within the study area were taken. Jack Rabbits, Lepus spp., and the Prairie Dog, Cynomys ludovicianus, were other mammals of major importance taken by the birds. Other mammals less frequently taken were: Black-tailed Deer, Odocoileus hemionus; Fox Squirrel, Sciurus niger; Muskrat, Ondatra zibethica; Marmot, Marmota flaviventris; and the Ground Squirrel, Citellus tridecemlineatus. Bird species taken by the foothills-nesting eagles include: Pheasant, Phasianus colchicus; Magpie, Pica nuttallii; Mallard, Anas platyrhynchos; Downy Woodpecker, Dryobates pubescens; and Horned Owl, Bubo virginianus.

The mammal species taken by the birds in 1954 indicate that the eagles had not foraged far from their nesting sites in searching for food. Of the mammals identified on the nests, all are known to inhabit the foothills.

The smallest number of different food items, fourteen, was counted on the nest of pair No. 11. Only four visits were made to this nest in recording the food, and, if more visits had been made, it is certain that the count would have been larger. The variety of animals taken by pair No. 11 were mostly birds; the only mammals counted were Cottontails. The predominance of bird species over mammalian species counted on this nest is in contrast with the food identified on the nests of the other pairs studied and with the studies made by other observers in other localities. Other studies have shown that mammals constitute the bulk of the diet of the Golden Eagles. A more complete study of the food of pair No. 11 should indicate whether they constantly take more birds than mammals.

Materials counted in 1952 from the nests at Round Butte indicate that this pair did much of their hunting in open areas of the plains. The location of the site is such that it might be equally well considered a foothills nesting site far out on the plains or as a plains nesting site close to the mountains. This is also shown by the mammal species taken by the birds. The Kangaroo Rat, Dipodomys ordii, and the Kit Fox, Vulpes velox, are both plains inhabiting mammals. The Pronghorn, Antilocapra americana, and the Prairie Dog, Cynomys ludovicianus, are also mammals which are more common on the plains. The two species of Cottontails, Sylvilagus nuttallii and S. auduboni, taken by the eagles at this site

are mammals found more often in the foothills and are used as evidence which indicate that the Round Butte site is a foothills nesting site.

#### SUMMARY

In 1954 the nesting sites of fifteen pairs of Golden Eagles were investigated in the eastern foothills of northern Colorado, an area about fifteen miles wide and eighty miles long. Only six of the fifty-two nests investigated were found to be occupied by the birds. A seventh pair of birds which probably nested was also noted. Thirteen pairs of birds were found to have nested in this area in 1943 in a study conducted by Malcolm E. Jollie; the present study indicated that the nesting of these birds has been reduced by half in a period of eleven years.

A food count was made on five of the nests occupied in 1954. Items which were counted were discarded in order to avoid errors in recount. The total items counted showed that mammals constituted the major food of the Golden Eagles, a conclusion reached by most observers who have studied the food of these birds. However, these other observers have found that Jack Rabbits constitute the bulk of the diet of the birds, while the present study of the eagles nesting in the foothills shows that 58.5 per cent of the food animals were Cottontails. Other mammals counted were Jack Rabbit, 11.3 per cent; Prairie Dog, 8.2 per cent; Black-tailed Deer, 3.1 per cent; Fox Squirrel, 2.5 per cent; Muskrat, 2.0 per cent; Marmot, 0.5 per cent; and the

Striped Ground Squirrel, 0.5 per cent. The birds counted were: Pheasant, 7.2 per cent; Eagle, 2.5 per cent; Mallard, 2.0 per cent; Downy Woodpecker, 0.5 per cent;

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Striped Ground Squirrel, 0.5 per cent. The birds counted were: Pheasant, 7.2 per cent; Magpie, 2.5 per cent; Mallard, 2.0 per cent; Downy Woodpecker, 0.5 per cent; and Horned Owl, 0.5 per cent. The mammal species identified on these nests indicated that the birds had remained close to the nesting area in foraging for food.

One nest studied showed a predominance of bird species over mammal species taken by the eagles. This is in contrast to the items counted from other nests and with the conclusions made by other observers in other localities.

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