



Report to the Bureau of Land Management
and
U. S. Forest Service
on
Raptors inhabiting Brown's Park
and the
Flaming Gorge National Recreation Area
1977

by

Phillip Wagner

Utah State Division of Wildlife Resources

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ABSTRACT

Raptors of the northeastern corner of Utah were studied from the summer of 1975 through the summer of 1976. The study area fell within the boundaries of USFS and BLM administered lands in the Flaming Gorge National Recreation Area and Brown's Park. A brief description of the geology, vegetation, and inventory methods is presented. Major emphasis was placed on cliff nesting raptors, but forest and ground nesting raptors are also included. Species, relative abundance, descriptions and maps of nest sites are contained within the report. Range manipulations and their effects on the raptor population are discussed. Also ameliorating techniques concerning these manipulations with regard to individual species are presented.

INTRODUCTION

The raptor population of the Utah portion of Brown's Park and the Flaming Gorge National Recreation Area was surveyed from the summer of 1975 through the summer of 1976. Approximately 480 sq. miles were inventoried. This was contained in a rectangular area roughly 37 miles in latitude by 13 miles in longitude. Of this, approximately 300 sq. miles were extensively searched for nesting raptors. These were the lands immediately adjacent to the Green River and Flaming Gorge Reservoir. Particular attention was focused on cliff nesters, as this habitat is of a more limited nature than that of the forests in the area.

Vegetation of the study area falls into three general categories, depending on exposure and altitude. Northern slopes, deep canyons, and higher elevations are dominated by large conifer stands consisting of ponderosa pine, (Pinus ponderosa) and Douglas fir, (Pseudotsuga menziesii). In the open country below the large conifers, big sage brush (Artemisia tridentata) patches extend into extensive tracts of pygmy conifer consisting of double-leaf pinyon pine, (Pinus edulis) and Utah juniper, (Juniperus osteosperma). The lower elevations and south facing slopes are dominated by desert shrub such as shadscale (Artriplex confertifolia), winterfat (Ceratoides lanata) and greasewood (Sarcobatus vermiculatus). Cultivated lands lie within the study area, and are adjacent to Manila and in Brown's Park. There are also range rehabilitation projects (pinyon-juniper chainings) and old burns scattered throughout the area studied. These were not treated differently and no attempt was made to determine the negative or positive influences of these features on raptors.

The cliffs adjacent to the river and reservoir are of extreme importance to nesting raptors. A brief description of the geology of the cliffs is therefore presented.

The majority of the canyons from Hideout Canyon to Indian Crossing and the deep canyons coming into Brown's Park are composed of quartzite found in the Mutual Formation which makes up the core of the Uinta Mountains. This hard rock forms high cliffs, good ledges, cracks, and pinnacles which a variety of raptors utilize as nest sites. Sandstone rock of the Weber Formation form cliffs on the south side of Kingfisher Island and the walls of Horseshoe Canyon. Weber sandstone is important to the osprey as it forms the strata for nine of the 10 osprey nests found in the NRA. Turkey vultures, red-tailed hawks, and prairie falcons also

utilize the caverns and ledges of this formation. The final formation considered is the Triassic undifferentiated rock topped by nugget sandstone found immediately north of Sheep Creek, and forms the impressive cliff extending from Flaming Gorge Reservoir to the Bennett Ranch. These cliffs are from 200 to 900 feet in height, cracks and ledges abound making them ideal for eagle and falcon eyries.

Raptors were inventoried by searching the cliffs with 7 x 35 binoculars and a 15X to 60 X spotting scope. A power boat was used to search the cliffs and canyons around the reservoir. A dory was utilized below the Flaming Gorge Dam to float the river to Brown's Park. The dory proved much more manuverable than rubber rafts and enabled one person to both row and act as observer. It also made stream side forays more practical as the boat could be beached almost anywhere. One three hour helicopter flight was logged utilizing a U. S. Forest Service fire control jet ranger. This proved effective in determining osprey nest status and locating additional nests and perches high on the cliffs. In the calmer water below Indian Crossing a 17 foot canoe was utilized to check Swallow Canyon and Gage Hollow. The terrain adjacent to the reservoir and river was searched using helicopter, truck, horse, and foot. Nests were observed to ascertain activity, condition, and amount of whitewashing present. All raptor eyries sighted were recorded as active, alternate or old sites. Active eyries were those nests where an adult was repeatedly sighted during periods when brooding, incubating or feeding young would normally occur. In addition to the presence of an adult, fresh mutes and vegetation on or around the eyrie site was also taken into account. Alternate eyries were usually nests in the vicinity of the "active" nest. Adults were not observed tending the nest, but presence of some fresh mutes and vegetation indicated it may have been used recently. Old eyries were those where sign of recent activity, i. e. mutes and vegetation, were absent. Some of the nests were very close to the present high water mark and these were suspected of having their use terminated by the rise of the reservoir's water. The sightings were recorded on U. S. G. S. topographic maps of the area and later transferred to a Forest Service and BLM map of the area.

Time did not permit all nests to be visited. However, several nests were inspected by rappelling or climbing to the structure. At this time, the young were banded, prey remains inventoried and nest material recorded. A total of nine young

were banded. These included six osprey, two red-tailed hawks, and one golden eagle. Following are accounts of those raptor species inhabiting the study area.

Genus: Cathartes

Turkey vulture (Cathartes aura)

Turkey vultures are large hawk-like birds. The head and foreneck are naked, with red skin characteristic of adults, while immatures show a blackish head. The head appears small in relation to the body. Wings are long and broad and form a shallow V shape when engaged in soaring. The wing linings appear darker than the gray or silvery flight feathers. This characteristic aids in distinguishing the turkey vulture from the golden eagle.

Ledges and caverns along the walls of the Flaming Gorge Reservoir are used as roosts and nesting sites. Five caverns or caves were identified as nesting sites. These were all located high on the cliffs within sight of the impoundment. One site is located in Red Canyon at the mouth of Trail Creek and Allen Creek; another is found on the east side of Kingfisher Canyon. The remaining three sites are in Horseshoe Canyon. Nesting sites are usually caves, often with two or more entrances. Eggs are laid on bare ground, usually in the darkest or deepest portion of the cave. Nest sites in the Flaming Gorge area are often associated with two or more roosts. Roosts are important as communal rest areas for the vultures. During the breeding season, non-breeding or immature birds continue to use the roost thus making these sites important to this segment of the population. Selection of roost locations may be related to presence of early thermal activity. Calm morning air inhibits or delays flight activity while early updrafts enhance soaring.

Turkey vultures are scavengers, feeding almost exclusively on carrion although occasional killing of an animal in the last stages of life has been documented (Bent 1937). They are equipped for this way of life with a sense of smell by which they locate their rotting and putrid meals (Brown and Amadon 1968). In northeastern Utah big game and livestock carcasses remaining after winter snows have melted may furnish food for this bird. Throughout the summer additional forage is likely provided by road-killed animals and dead waterfowl and fish found along the edge of the reservoir. Vultures have been observed feeding along Utah highway 260, between Greendale Junction and Dutch John on several occasions.

Turkey vultures are very common throughout the area. White and Behle (1960) found 23 vultures in Horseshoe Canyon in 1959. Forty or more birds are a reasonable estimate of the vulture population in the area. There appear to be two groups of these birds, a large concentration at the mouth of Trail and Allen Creeks and a group throughout Horseshoe Canyon.

Vultures excel at soaring on updrafts and the presence or absence of these winds determines whether or not the large birds will forage or fly on any particular day. Under favorable conditions they are quite visible during the summer after 9 A. M. This coincides with a rise in temperature and accompanying thermals along the canyon walls. On rainy, cloudy days vultures are often sedentary, although they can be seen soaring on windy days even though it may be overcast. Upon taking flight they often soar around forming a large flock prior to heading for a feeding area.

Turkey vultures appear in northeastern Utah between the end of March and middle of April. They summer in Brown's Park and Flaming Gorge National Recreation areas. Vultures are also present throughout the Uintah basin. In September the vultures begin to move out of the area and by mid-October have completely left. They are reported to migrate in large flocks and move as far south as Panama and Mexico (Brown and Amadon 1968).

Genus: Accipiter

Accipiters are forest dwelling hawks found throughout the forested areas of the NRA and Brown's Park. Females are always larger than the males and are equipped with a brood patch during the breeding season. They have short, broad, rounded wings, a long, narrow, heavily barred tail, and a longish slender body. Accipiters are most often seen darting quickly through the forest. They fly with a burst of rapid wing beats, a short glide, and another burst. Accipiters are sometimes observed soaring, usually in late morning, but this is not a frequent occurrence. Birds make up the largest source of their diet, although squirrels, rabbits, and mice are also taken. In the NRA - Brown's Park area two accipiters were occasionally seen, the goshawk and the Cooper's hawk. The third accipiter, the sharp-shinned hawk, is also reported for the area.

Goshawk (Accipiter gentilis)

Goshawks are the largest member of the accipiter clan. They are medium large (red-tailed hawk size) with blue-gray on back and wings, while undersides are lighter with slaty gray cross-hatching. The eye is red in adults with a distinguishing white stripe above. The crown is a dark blue-gray. Juvenile birds can be distinguished from the adult by the presence of a yellow eye, dark brown color above, and light brown or tan abdomen with dark brown vertical streaking.

Goshawks have an affinity to a nesting area and return yearly to the same general location. They do not, however, share this affinity with a particular tree as they may build a new nest or repair an old nest, not necessarily one of the previous year.

Thick stands of conifer (Douglas fir and ponderosa pine) and aspen groves located near permanent water furnish nesting habitat in the study area. Three nesting areas were located. A nest was found about 100 yards south of the Utah-Wyoming border one mile west of Three Corners. This nest was situated high in a mature aspen in the middle of a thick grove of aspens. Although this nest was unused the past year, feathers, nest construction, and other debris indicated goshawk activity. A large basin of Douglas fir situated above Orchard Draw in Brown's Park is used as a breeding area for a pair of goshawks. The specific site was not located, however, the presence of two immature goshawks (branchers) below the basin indicates nesting activities. A decadent grove of old or dead cottonwood trees is found on either side of the small permanent stream which trickles down the draw. Pinyon-juniper covers the rocky hillsides adjacent to the cottonwoods and extends up along the sides till it meets the larger conifers on the northeast slope of the basin. Ponderosa pine furnishes nest sites for goshawks in the Greendale area. Goshawks nested in the "Acres" summer housing area, but moved after their nests were repeatedly disturbed or destroyed by some of the summer residents. During summer the birds are still seen in the area. Another area goshawks are reported nesting is the Eagle-Lake Creek basin. A winter survey failed to locate any nests, however, an adult was sighted in the area.

Primary hunting habitat of the goshawk is found within or adjacent to the forest. This propensity is reflected in its diet. Goshawks are known to take

grouse, woodpeckers, forest dwelling hawks and owls and passerines, especially those found within forested areas such as blue jays, grosbeaks, cross-bills, and robins. Also taken are forest dwelling mammals such as chipmunks, squirrels, cottontail rabbits and hares. Hunting is accomplished by flying low over thick cover or by perching unobtrusively in a dense tree. When prey is sighted a burst of rapid wingbeats overtakes the quarry. Because overtaking prey is the means of survival, ambush or surprise type hunts are used, therefore, the goshawk is rarely seen perching in the open. It likewise does not normally hunt large open areas, although it will hunt from heavy vegetation adjoining such an area.

Goshawks do not migrate south, however, they do show an elevational movement and often winter in lower elevations. Goshawks have been observed in the NRA and Brown's Park between early December and late January. Four observations of single goshawks were made during the winter in Brown's Park. On December 3rd a mature goshawk was perched in a cottonwood near the old Parson's ranch. The following day an immature goshawk was perched in the same location. The hawk chased a small bird then returned to the same perch. When both birds flushed they flew up the wash and disappeared. Later in December, two more goshawk sightings of a mature and an immature bird were again observed in the same location on two separate occasions.

A lone goshawk was observed flying across U-44 in the Eagle Creek area on January 26. This bird crossed about 25 feet above the highway flying northward or downhill in this area. There was an accumulated snow depth of approximately 18 inches and the weather was foggy. These sightings would indicate the goshawks winter even at high altitude (7900 feet) in this area.

The goshawk is likely more abundant in the study area than the paucity of sightings indicate, for the following reasons. The NRA is heavily wooded with dense stands of both conifer and aspen scattered throughout the forest. There are a large number of small drainages with associated small streams and ponds within this area. Finally, prey is abundant in the form of avian and terrestrial fauna. The above indicate that optimum goshawk habitat and food sources are both available and abundant. Also due to its preference for dense cover the birds are not likely to be seen even though in the vicinity. Except for a winter excursion no intense search was made for goshawk nests. The Brown's Park area contains a

nesting pair although the Park as a whole has very little habitat for the goshawk. The draw where the goshawks are found appears to be marginal. This could be an indication that prime habitats are filled.

At one time goshawks were considered vermin, with bounties and hunts being conducted expressly for eradication of this species. Today it is protected and the population appears to be stable. Falconers have been known to decimate local populations by robbing nests of all young year after year. For this reason, nest sites must not be divulged to the public.

Forest grouse constitute a large portion of the goshawks' diet, especially in the winter. However, hawk predation is not known to limit this resource. Game bird and poultry raisers in the past have been plagued with predation by this bird. However this does not appear to be a problem in this area. The hawks may conflict with humans during the nesting season. Individuals have been known to be very aggressive, attacking and striking anyone venturing into their nesting area. Accordingly, housing, trail, and campsite development should be restricted in goshawk nesting areas.

Sharp-shinned hawk (Accipiter striatus)

The short broad wings, long narrow tail, and long slim body characteristic of accipiters are all present, but in reduced size on this small hawk. The sharp-shinned hawk male averages 11 inches while females average 14 inches in length. Adults are blue-gray above with rufous or tawny-buff underparts. The eye of the adult is red while that of the immature bird is yellow. The tail is square and may appear notched. This aids in differentiating between it and its larger relative the Cooper's hawk. When viewed in flight the head and neck protrude farther than the Cooper's hawk. The front edge of the tarsus is very narrow, hence the name sharp-shin. Females are easily confused with male Cooper's hawk because of similar size, shape and coloration.

No sharp-shinned hawks were seen in the study area, however, White and Behle saw this species and found evidence of nesting at Allen Creek prior to the impoundment. Twomey (1942) reported four birds on June 10, 1937, at Green Lake. He also observed sharp-shinned hawks foraging along the Green River in dense willows. Hayward (1967) found sharpies along stream bottoms in riparian areas. These areas are now under water and former habitat may have been eliminated with

the construction of the Flaming Gorge Dam. Good sharp-shinned hawk habitat was not abundant within the study area although Twomey (1942) speculated that the species was nesting in the vicinity of Green Lake. Twomey (1942) also reported large numbers of sharp-shinned hawks migrating along the Green River Valley in September, coinciding with the sparrow migration.

The sharp-shinned hawk's diet is almost exclusively small birds. It is also known to take nestlings for its meal. Much of this hawk's prey is captured by a quick dash from heavy cover. It is adept at seizing its prey both in the air or on the ground. Bushes and shrubbery do not deter its attack as it will plunge through the thickest foliage while in pursuit of sparrows, juncos or other small birds. The Flaming Gorge-Brown's Park areas contained much potential prey for the hawk. Small birds are common and the scarcity of these hawks has little to do with a limited prey base, but as alluded to previously, the inundation of former nesting habitat.

Cooper's hawk (Accipiter cooperii)

This hawk is intermediate in size between the small sharp-shinned hawk and large goshawk. It is crow-sized with males weighing 380 gr. and females 561 gr. (Brown and Amadon 1968). The adult male Cooper's hawk is easily confused with the female sharp-shinned hawk, while the immature female Cooper's hawk can be confused with the immature male goshawk. The tail of the Cooper's hawk appears slightly rounded, aiding in distinguishing the female sharpy from the male Cooper's.

River riparian, pinyon-juniper and mature stands of deciduous trees are habitat preferred by the Cooper's hawk. It appears to be more ubiquitous in the Uinta basin than either the goshawk or sharp-shinned hawk. It may be seen along the Green River waterway from 7,000 feet in the NRA down to 4,500 feet below Ouray. Twomey (1942) saw a pair of hawks and collected one specimen in the Green Lakes area. During the study, a Cooper's hawk was sighted soaring above Allen Creek.

The terrain in the Allen Creek area is very steep with Douglas fir on the hillside and mature stands of ponderosa pine found on the top. Large cottonwoods (Populus agustifolia) are located at the mouth of Trail and Allen Creeks, which may furnish nesting habitat for these birds. A second sighting in the Flaming Gorge

area was recorded above Mustang Ridge. A mature Cooper's hawk was sighted flying across the road leading to the Dutch John boat ramp. The predominant vegetation is pinyon-juniper and the Cooper's hawk quickly disappeared in the thick trees. Brown's Park may have nesting Cooper's hawks as one was sighted at the mouth of Swallow Canyon in late August. It flew along the pinyon-juniper trees scattered under the low cliffs, perched on a dead juniper, then flew out of sight over the top of the cliff. Some cottonwoods, among thick growths of small willows (Salix spp) and tamerisk (Tamarix pentandra) are found along the river, but the major vegetative type is pinyon-juniper above the river.

Cooper's hawks take medium sized birds, but red squirrels, chipmunks and small lizards and amphibians may enter the diet, especially in the pinyon-junipers where a substantial lizard population is found. No nests were located and consequently prey of the Cooper's hawk could not be studied.

In the northern part of its range the Cooper's hawk migrates south for the winter. Cooper's hawks are observed above Provo moving south in large numbers during late September. Twomey (1942) recorded a "small migration" moving along the Green River valley. During the winter surveys in the area no Cooper's hawks were recorded and there is little reason to believe the bird remains in the area during winter. A mild fall may delay the movement of small birds and consequently postpone this hawk's departure to warmer environs.

Large scale chainings or burnings may adversely affect this species. However, small scale range improvements would benefit it by increasing numbers of small mammal prey available (Baker and Frischknecht 1973). Because of its habit of remaining close to thick cover and darting out into the open when prey is in close proximity, small openings which increase the seeds and insects available to passerines also increase the Cooper's hawks opportunities. The period of mid-May through mid-September is critical to Cooper's hawk nesting success. Any range improvement undertaken should be confined to those months when nesting will not be affected. Disturbance or removal of a nest tree (after nesting season) is not too important as Cooper's hawks rarely return to the previous year's nest (Bent 1938, Brown and Amadon 1968). Nesting areas, however, should be protected and efforts should be made to avoid clearing where a large number of nests are found.

As these are in heavy, dense, stands which are not necessarily typical throughout the area, elimination of a nesting location may therefore eliminate production.

The Cooper's hawk suffered mass persecution in the past and still is occasionally shot by those individuals with little respect for wildlife or public law. Their populations have shown a decline. Habitat deterioration and pesticide contamination have contributed in part to this dilemma (Snyder 1974). With the construction and filling of the Flaming Gorge Dam, riparian areas along the Green River were destroyed and much Cooper's hawk habitat was lost. White and Behle (1960) observed this hawk in Horseshoe Canyon, at Hideout forest camp, and flying across the river at Skull Creek. White also located nests in cottonwoods and ponderosa pine along the river.

Human activity outside of direct killing does not seem to unduly disrupt their activities and they are often found nesting in close proximity to camp grounds. If their nest or nest tree is disturbed they become extremely aggressive and may strike an intruder attempting to reach their nest.

Cooper's hawks are used in the practice of falconry although they are difficult to keep and often display bad temperament. Nest sites should be kept confidential. The population has probably stabilized since the dam construction and it is expected that, barring unforeseen events it will not decrease in the future.

Genus: Buteo

Buteos are large to medium sized, broad winged, broad tailed hawks. They have large chunky bodies, with either feathered or unfeathered tarsi and talons of average length. The adults are distinctly marked while the immature plumage is often streaked and indistinct. Immature buteos are difficult to distinguish between species. Color phases are common among this genus which also hinders identification in the field. Females are larger than their mates, but differences in plumage are not usually evident.

The majority of prey taken is composed of small to medium sized mammals. They will, however, feed on insects, birds, lizards, and amphibians. Seldom are they observed taking prey larger than a jackrabbit.

Red-tailed hawk (Buteo jamaicensis)

A medium-large raptor in size with a reddish or chestnut colored tail that is very distinctive in adults. The body often displays a dark band across the abdomen which is useful in identification. The leading edge of the wing lining between the wrist and body is dark and visible when the hawk is soaring. The young are only identified by careful observation and much practice as they are quite similar to Swainson's and ferruginous hawks within whose range they occur.

The red-tailed hawk may nest on cliffs or in trees. Usually the nests are high above ground, but nests in low trees are not uncommon. They display little preference for a particular tree type and will nest in aspen, cottonwoods, ponderosa pine and junipers. Nests are found among dense stands of conifer or aspen, but are more likely to be found adjacent to open sagebrush or any scrub flats. Cliff ledges both in the open and under overhangs are frequently used. In the Flaming Gorge area, red-tailed hawk nests are found from approximately 20 feet in height, (in Wyoming) to as high as 150 feet above the water (in Horseshoe Canyon). Most nests are located between 50 and 90 feet above the surface. Of five nests located, one is above the reservoir, while four are located above sagebrush flats. Sandstone cliffs compose the majority of old and new nest sites with only one nest in a juniper tree. A ridge of south facing low cliffs in South Valley and along the Reaves has eight nests one of which was active this year and another active the past year. Horseshoe Canyon has a number of red-tailed hawk nests. These are found on a high ledge on the north side of the canyon. In August, a helicopter flight located what appeared to have been an active nest on this ledge. Red-tailed hawks were seen in this location flying back and forth along the cliffs and perched in fir trees on a small bench along the wall. A pair of red-tailed hawks was twice observed copulating in the Glades area. A low cliff runs along the north edge of this long narrow basin. Two old red-tailed hawk nests are located on ledges of this ridge, but neither was active. As the hawks were observed in this area during the summer, it is believed they nested below the cliff in one of the junipers which are abundant along the edge of the basin. In September a nest was located above Pigeon Basin one-fourth mile southeast of the Utah-Wyoming state line. The nest is 30 to 40 feet above the ground and is situated near the top of a low cliff overlooking open sagebrush country. Feathers and mite on the exposed cliff suggest it was active the past summer.

Jackrabbits, cottontail rabbits, and other small and medium sized mammals are taken as prey by the red-tailed hawk. They may also take snakes, lizards, and small to medium sized birds. The red-tailed hawk is a very aggressive bird with powerful feet and it therefore will take larger prey than most of the other buteo species. It hunts either from a high perch on a cliff, tree, or pole, or while soaring above large open areas. It is adept at catching rabbits as they dart across open grassy areas between sagebrush. On windy days red-tailed hawks may be observed soaring in a stationary position with their wings half folded as in a shallow dive.

As winter approaches, they begin to leave the area. Severity of the winter weather determines the magnitude of the migration. During mild weather red-tailed hawks may be encountered throughout the winter. However, local hawks have probably moved south and the hawks remaining are northern migrants. In late March five red-tailed hawks were observed in Brown's Park. Later in the spring and summer no red-tails were sighted in this area. These are therefore concluded to have been hawks moving northward. Red-tailed hawks were occasionally sighted in late March and early April in the Flaming Gorge area. In mid-April consistent sightings of these hawks were made and these are considered to be the breeding hawks of the area.

White and Behle (1960) reported two red-tailed hawks in the Utah portion of the present reservoir. Twomey (1942) saw the species around Green Lake. While not as abundant as one would suspect, they are not uncommon in the NRA. Brown's Park presents an anomaly between habitat available and red-tailed hawks utilizing it. Open sagebrush and dry scrub flats and grass lands in the form of hayfield and pastures are abundant. Nesting habitat is available as both cliffs and suitable trees are found throughout the park. Prey populations have been consistently high, especially the cottontail rabbit which is often found in the red-tailed diet (Bent 1937). Red-tailed hawks have a propensity toward the above described conditions yet an enigma exists between the lack of these large hawks and the apparent favorable environment available.

Red-tailed hawks are particularly helpful to farmers and ranchers by virtue of the large number of rodents in their diet. In a Wyoming study greater than 75 percent of the western red-tailed hawk's summer diet was composed of Uinta ground squirrels and meadow mice (Craighead and Craighead 1956). As these rodents are

in direct competition with domestic livestock, the hawk's presence is an economic benefit to the agriculturist.

Red-tailed hawks are a very conspicuous raptor. They are frequently seen while soaring or perching in their open hunting habitats. Thoughtless shooting has taken its toll of this species. Also jeopardizing this birds existence is their propensity to nest in close association to agricultural activities. Nest desertion may be caused by disturbance during early stages of egg laying or incubation.

Range improvement practices would conceivably ameliorate this hawk's habitat in the Bear Top and Goslin Mountain areas. If done on a reduced scale, confined burns would open up the large expanses of pinyon-juniper to grass, forbs and shrubs which could attract and spread their population through the NRA. Any type of range modification should be conducted after August 1st to lessen the impact on the red-tailed hawk. As these hawks are proficient at nest construction removal of a nest tree should not have an adverse affect on future nesting.

Red-tailed hawks were reported by White and Behle (1960), but they were not thought to be abundant. The past summer, four nesting areas were located in or adjacent to the NRA. Two of these were within the NRA boundary, one was on BLM lands, and one on private property. Although Brown's Park appears to have favorable habitat no red-tailed hawks were observed in the Park after March. Red-tailed hawks are frequently sighted soaring over sagebrush and dry scrub flat and grasslands where they hunt for small to medium sized mammalian prey.

Swainson's hawk (Buteo swainsoni)

The Swainson's hawk is a medium sized hawk. It has a dark head with a dark chest band and whitish abdomen and legs. When viewed in flight, the wings appear longer and narrower than the other buteo hawks. This hawk is the only buteo that displays lighter colored wing linings contrasting with darker primary and secondary feathers. This is a very good characteristic when identifying a soaring Swainson's hawk. The tail is faintly barred and also may appear whitish. Juvenile Swainson's hawks are difficult to distinguish from juvenile red-tailed and ferruginous hawks. In hand, they may be distinguished from the ferruginous hawk by the absence of a feathered tarsus. The differences between the red-tailed hawk and Swainson's are very minor, the best criteria being the white plumage on the basal half of the Swainson's tail. This, however, can only be viewed from above. To add to the con-

fusion, the Swainson's hawk displays the different color phases of this genus. They may grade from light to very dark individuals of the same race.

Swainson's hawks prefer open country. They are found hunting above grasslands, cultivated fields, along the edge of marsh lands, brush flats and dry scrub expanses. They often perch on fence posts, poles and on the ground, preferably on a ridge or knoll overlooking one of the above mentioned haunts.

Nests are seldom on cliffs, preferring trees and bushes instead. Swainson's hawks will often utilize man-made structures such as telephone and electric poles, abandoned windmills, haystacks, and old hayloaders. Utility company policy advocating removal of nests during nesting season destroys entire clutches or broods. The nests are often of flimsy construction and high winds during the nesting season take their toll.

The hawks add much greenery to their nests throughout the summer which sometimes camouflages the structure. Some human disturbance may be alleviated because of this practice. In some areas where they commonly nest they appear sporadically from year to year. This may be determined by the abundance of small rodents, when the hawks return to the area in spring. As insects, particularly grasshoppers, do not appear till late June or early July, a lack of small mammalian prey may influence this hawk's nesting.

Small mammals and lizards are consumed, but during certain times of the summer season their diet is reported to be almost exclusively insects. They do not have as powerful a foot as other raptors their size and this may adapt them for capturing the larger insects.

As alluded to previously, Swainson's hawks are strongly migratory. In the fall they form huge flocks as they move from Canada and the northern states down to Argentina (Bent 1938). Their flocks are reported to be enormous as they pass through Central America where they are confined to a narrow corridor. At one time they were known as the locust hawk (Brown and Amadon 1968) because of their habit of pursuing this insect while on their winter grounds. They return north each spring appearing in Utah in April.

Swainson's hawks are common nesters in the Uinta Basin. White and Behle (1960) reported a pair in Wyoming at Green River mile 354. The party also reported

two sightings in the Henry's Fork-Green River area in 1959. No Swainson's hawks were observed in either the NRA or Brown's Park during this investigation. A rancher in Brown's Park (S. Radosovich pers. comm. 1975), however, reported this bird to be nesting in cottonwoods near one of his hayfields. The trees in this area were searched for sign of nesting but none was found.

Rough-legged hawk (Buteo lagopus)

The rough-legged hawk is a medium-large sized raptor with smaller than expected talons for a bird this size. They display the variation in color grading from light to dark or melanistic individuals. Head and breast are light in color, and a dark, wide band is displayed across the abdomen. The wings are broad, with a dark carpal patch visible on the underside. The primary feathers have dark tips. The tail has a white sub-terminal band with a dark band near the tip.

The rough-legged hawk's posterior appearance is similar to the marsh hawk, but may be differentiated by the placement of the white on the tail feathers of the rough-legged hawk compared to the white on the rump or lower back of the marsh hawk. Immatures display plumage much like the adult but without the bright yellow cere and talons. The tarsus is fully feathered. This bird is found in this area only during the winter.

Open country of sagebrush, desert scrub, grasslands, and marshlands are favored haunts of this winter visitor. They may be observed perched on the ground on small frost humps, low fence posts, utility poles, on steel towers, or in the very tops of cottonwood trees. Seldom are they observed perching on the heavy or thick branches around the base or middle of these deciduous trees. Their small feet are much more adapted to gripping the small branches which occur near the tops of the trees. This preference may aid in identification between other hawks. Often rough-legged hawks congregate on steel towers of electrical transmission lines. This occurs in Utah, but has not been observed in the NRA. The rough-legged hawk's habit of perching on low frost humps may carry over from its summer habitat in the tundra where for lack of poles, posts, or trees, humps of this nature are the only abundant feature with which to gain the elevational advantage all hawks desire.

As is the case with most buteo hawks, the rough-legged hawks hunts open country. It hunts by perching in a likely spot, soaring high above grasslands with

low vegetation, or soaring lower to the ground stopping occasionally to hover. Its attack comes after one or two wing beats which lift it off its perch and positions it so that by folding its wings or holding them high above the back it can drop onto the unsuspecting victims. They have been observed to use the more conventional stoop or dive often as they soar over a crest of a hill and catch an animal in the open.

Rough-legged hawks capture mainly mice in their winter quarters. As the afore mentioned talons are quite small for a bird this size, larger mammals are difficult to grasp and maintain a grip. They are recorded to take cottontail rabbits, wounded ducks and other waterfowl and carrion. One was observed taking a hungarian partridge in northwestern Utah which is considered atypical prey for this hawk.

The habit of eating roadkilled rabbits imperils this species when on its winter sojourn. They are quite trusting and will allow a vehicle to close in and stop or they may spread their wings and be buffeted by turbulence great enough to injure the tendons in the carpal joints. They are also victims of collisions with motor vehicles as they glide in to or fly away from a road kill.

In the study area, rough-legged hawks were commonly seen in four areas between the months of November and March. One location was in South Valley near Manila where a pair of the hawks spent the winter. Three other locations were located in Brown's Park. Near the Brown's Park Waterfowl Management Area headquarters, three to four rough-legged hawks could be seen perched on fence posts or hunting the hay fields and marshlands. The upper hayfield seemed to attract their attention in the morning and late evening, while the fence and adjacent pasture below the headquarters was used in the early afternoon for perching and hunting attempts from the posts. A melanistic individual habitually used this area. Near the mouth of Sears Creek three to five hawks would perch in cottonwood trees in the late afternoon. At dusk they could be observed moving from the upper chained flats down to the river. A group of cottonwood trees provided a perch for at least two individuals. They could be observed in late afternoon and during the morning.

Perches are important to this hawk and some range may be made available by the erection of artificial perches. Old utility poles that are in areas of limited human access should be viewed as potential perch sites. Care should be given in

eliminating dead trees or snags as these are frequently utilized by this hawk. Specific sites for perch consideration would include, Antelope Flat between Spring Creek and Jug Hollow, parts of Taylor Flat without perches, open areas above Martin Draw and Clay Basin.

In March and April they begin their trek northward. Birds that winter in Utah may breed within or near the Arctic Circle. Summer range may somewhat resemble winter haunts as they also nest in the open tundra areas of Canada and Alaska.

Ferruginous hawk (Buteo regalis)

The largest of Utah's buteo hawks, the ferruginous hawk is found in the open arid areas throughout the state. The legs are feathered to the toes as in the American rough-legged hawk and indicated by its older name, ferruginous rough-legged hawk. The head is whitish, but may have different degrees of dark striping. The abdomen is commonly light in color and when viewed against the sky the reddish-colored legs form a darker "V" on it. The undersides of the tail and flight feathers of the wing are light in color. The ferruginous hawk displays color phases that vary in degree from light (normal) to very dark (melanistic). The different phases hinder accurate field identification, but in the darker individuals the undersides of wings and tail still appear whitish. The shoulder of the light or normal ferruginous hawk appears rust colored when viewed on a perch.

Ferruginous hawks nest in or adjacent to the open country they hunt. They build large stick structures in the tops of trees (pygmy conifers), on low ledges on bluffs, on the ground, or sometimes on man-made structures. In Colorado, tree nesting ferruginous hawks were found to have lower fledglings per nest than ground nesters (Olendorff-Stodart 1974). A study in northwestern Utah, however, found a very low reproductive success from ground nesters and 92 percent of the nest sites were located in trees (Howard and Wolf 1973). In central Utah, Smith and Murphy (1973) located nests both on the ground and in trees (juniper and cliffrose, Cowania mexicana). Nests built on the ground are commonly found near the top of a knoll or on a rock projecting out from a hillside.

The ferruginous hawk is an early riser, hunting in the early light prior to sunrise. It likewise is late to bed, hunting late in the afternoon in the waning light

of sunset (Weston 1969). It hunts by soaring and hovering; when prey is sighted a stoop from its lofty vantage point is used to secure its meal.

Animals found on the open plains or grasslands constitute the major prey sources of the ferruginous hawk. These include jackrabbits, prairie dogs, pocket gophers, ground squirrels, and mice. Jackrabbits are usually the single most important prey item from a biomass standpoint, (Smith and Murphey 1973, Howard and Wolf 1973, and Platt 1971). However, Platt noted great diversity in prey remains found around the nest. These included a mustelid, a short-eared owl, a harrier, lizards, pheasants, and a meadowlark. Ferruginous hawks appear unable to adapt to reduced prey numbers. In northwestern Utah the lagomorph population declined by 79 percent while the usage of this resource only declined by 10.5 percent on a weight basis (Howard and Wolf 1973).

Ferruginous hawks were not found nesting in the Utah portion of the NRA or Brown's Park. However, the habitat east of the reservoir, Antelope Flat, Goslin Mountain, and Clay Basin appears to meet the criteria necessary for ferruginous hawks. That this hawk is absent from these areas may be an indication of the amount of public use these lands receive. The ferruginous hawk is less tolerant of human activities than the other buteo hawks, (Olendorff and Stodart 1974). They are very prone to nest desertion prior to egg laying and through incubation up to hatching. Interference while these birds are establishing territories will likely preclude any nesting attempt (Fyfe and Olendorff 1976). Of the three areas listed, the upper portion of Goslin Mountain may still have viable habitat and may contain nesting ferruginous hawks. However, none were observed although only a limited amount of time was spent in the area.

In late February a ferruginous hawk was observed along highway 43 on a post at the head of Linwood Canyon in Wyoming. The weather had been mild and the ground had very little snow cover. Prairie dogs and cottontail rabbits were frequently seen on this occasion. This is an example of the unstructured migratory behavior these birds may exhibit, moving north or south depending on weather conditions. This was the only winter observation of a ferruginous hawk.

It does not appear that suitable nesting structures is limiting the ferruginous hawks in either the NRA or Brown's Park. Low cliffs and juniper trees are both abundant throughout the area. However, roads and public pressure may have preempted

this hawk from the area. Goslin Mountain habitat and the limited recreational opportunity found here in the spring suggest that ferruginous hawks can still nest in this area. However, more control over access on this mountain may be desired to enhance nesting.

Golden Eagle (Aquila chrysaetos)

The golden eagle is the largest raptor found in Utah. The characteristic shape of the buteoninae hawks is depicted in exaggerated form in this magnificent bird. It is a large, dark hawk with broad wings and tail. The tarsus is fully feathered to the toes. In adults, white markings are not apparent. The head and neck display a "golden" hue when viewed in sunlight. The average female is nearly one fourth larger than the average male (Brown and Amadon 1968). Immature golden eagles display a white patch under both wings at the carpal joint. The juvenile tail has a wide white band on the basal portion with the terminal two thirds dark brown or black. The immature bird may appear slightly darker than the adult. With each successive molt the young eagle retains less white on the wings and tail. By the age of three to four years the adult plumage is fully acquired.

Golden eagles may be confused with turkey vultures and from a distance a melanistic buteo. The buteo is a much smaller bird although the shape is basically the same. The turkey vulture can be distinguished from the golden eagle by the very small head, gray or silver flight feathers of the wings, and a longer narrower tail. Immature bald eagles are sometimes confused with the golden eagle. However, the mottled white on wings (especially wing linings), body, and tail of the young bald eagle differ from the all dark adult or the distinct white patches of the immature golden eagles.

In Utah, adult golden eagles are found year round near their nest sites. During the winter an influx of northern golden eagles occurs. They increase local populations, but cannot be distinguished from the resident eagles. Antagonistic encounters between the two groups have not been observed. In late February and early March the northern transients leave northeastern Utah.

Open country found in the mountains, on high plateaus, and along rivers and streams is the haunt of the golden eagle. The northeastern corner of Utah fulfills this criteria with the deep river cut canyons and the sagebrush flats found above the canyons of Brown's Park and Flaming Gorge. The precipitous canyon walls are

used as nest sites while the open desert scrub-grassland flats are used in hunting.

Nests are found on both high and low cliff ledges, in trees and occasionally on the ground. In the area of study only cliff nesting eagles were located and there is no reason to believe trees were utilized although suitable trees are abundant. Ledges are usually three or more feet wide, some crevices were used where a large boulder had lodged in the vertical crack thereby forming a base on which to build a nest. A ledge as low as 60 feet above the ground was used, but the majority of the nests were on cliffs 200 or more feet in height. Of fifteen nests used the past two years, 13, or almost 87 percent, had an eastern exposure.

Material used in construction of nests is mainly sticks and small branches. Vegetation found in the vicinity of the nest site, such as pinyon, juniper, sagebrush, greasewood, willow, grasses, and prickly pear (Opuntia), is used to form or line the structure. Nests are added to year after year and are often very bulky and conspicuous. Some nests found in the area are over six feet in height and greater than four feet across. Generally the nest cup is not very deep and usually fills in after the young become active.

Golden eagles exhibit a tenacity to a nest site, returning year after year to a particular territory. In Utah they are also found in this vicinity year round. As nesting season approaches they spend more and more time around the nest. Eagles may reuse the previous year's nest or choose an alternate site. If an alternate is chosen, it is often in close proximity to a previously used nest. Prior to nesting the pair spends much time in nest repair. This includes adding vegetation to several nests. After picking a nest the male may continue to refurbish one or two alternate sites throughout the nesting season. Eagles may have as many as ten alternate nest sites (Brown and Amadon 1968). In the NRA-Brown's Park areas, three or four alternate nests are commonly found in association with an active eyrie. Old nests which haven't had vegetation added in four or more years are also common. Some of these are suspected of being abandoned since the rise of the reservoir. An example of this is found on the northwest side of Spring Creek Bay. There are also several more old nests in the Wyoming portion of the reservoir. These vividly illustrate a loss in eagle nesting habitat, since the pairs that formerly nested on these cliffs probably had no unoccupied cliffs to move into when displaced.

Active eyries are often conspicuous due to an accumulation of fecal material (mutes) below the nest. This shows as white staining on the rock and is most apparent just prior to fledging due to the combined excreta of both young and adults.

Golden eagles are common nesters in the Brown's Park-Flaming Gorge area. Eleven nest sites were occupied the past year, eight of these are in the NRA, two in Brown's Park, and one is located north of Manila on the Wyoming-Utah border. Characteristics applicable to all eleven nests are as follows; they were on cliffs, in the upper third of the cliff face and had hunting territories located above the nest. Four types of rock strata were used, one on a sandstone outcropping, four were on the sandstone wall north of Sheep Creek, four were located on narrow canyon walls, and two were located in canyons above large flat expanses with pinyon-juniper dominating the vegetation.

The nest north of Manila is located among a cluster of three very large old nests. It has been recently constructed and is inconspicuous due to the three obvious nest structures on prominent ledges around it. Four occupied nests are located among old and alternate nests that line the high cliff wall along the north side of Sheep Creek and Sheep Creek Bay. This sandstone wall is approximately 900 feet high at the highest point and 200 feet high one mile west of Sheep Creek Gap. Two of these nests had adults present and feeding young in late May. The other two had a pair of adults on the nest and in the nest area in May, but sightings of them bringing prey to the nest were not made. Two additional nests were located above the reservoir in Red Canyon. Along the east side of the narrow canyon formed by Carter Creek a pair of eagles was observed in attendance in early June. One half mile west of the mouth of North Skull Creek an eagle nest was observed in a recess in the rock wall. Mutes and a pair of adults present indicated it was in use. A nest in a pot hole which was active the previous summer is less than a mile south-southwest of the present site and was inactive this year. Two additional nests were located in the NRA below the dam along the Green River. These are situated high in the quartzite cliffs along the south side of the river. Eagle activity was observed in these areas throughout the summer, but the active nests were not located until after the nesting season. In Brown's Park, two additional nests were located, one above Sears Creek near the mouth and on the west side of the canyon, the other in

a small draw on the Colorado-Utah state line. An active nest in Crouse Canyon was not used the past summer despite the pair carrying greenery to it in early spring. Other sightings in the Spring Creek area, Grindstone Spring, and Dutch John Gap did not produce an active nest. Golden eagles were observed copulating above Dutch John Gap and west of Minnie's Gap, but later spring and early summer observation in these areas failed to locate any eagles.

Lagomorphs formed the major portion of the golden eagles diet in a study done in central Utah (Smith and Murphy 1973). In eagle eyries visited in the Uintah Basin jackrabbit hind legs comprised the majority of the prey remains followed by cottontail hind legs. In the one nest visited in the study area eight cottontail hind legs were the only prey remains recorded. Prey available to the golden eagle in addition to the above includes prairie dogs, ground squirrels, marmots, ducks, geese, sage grouse, other avian raptors, and snakes. They also use carrion, especially in winter. In January a pair of eagles was observed on Taylor Flat feeding on a yearling mule deer that had been killed the previous night by coyotes.

Animals as large as mule deer may be preyed upon by individual birds. A disabled adult female mule deer was found in Clay Basin with a strip of hide torn from the top of its back down to the shoulder. Marks on the deer did not indicate a vehicular collision nor cougar or coyote attack. The deer was dispatched, and examination of the bone marrow indicated it was malnourished although the winter was mild and browse was available. At the time eagle predation was not considered but in retrospect it is mentioned as a possibility. Golden eagles produce deep punctures when attacking (Alford and Bolen 1972) and also tear or rip the skin (Wiley and Bolen 1971), wounds that were obvious on the deer. (See photos).

Waterfowl play an important part in some golden eagle's diet. Prey remains found around a nest in Rich County, Utah, were almost exclusively duck wings and legs. The nest was situated near a reservoir with a large population of nesting ducks (Don Paul pers. comm. 1976). On spring goose surveys along the Green River nesting Canadian geese remains are often found on isolated islands in the middle of the river. The golden eagle is one of the few predators with access to this resource. Below the confluence of the Yampa and Green Rivers, in Echo Canyon, an adult golden eagle was observed making three diving attacks at two individual geese.

The attack was aborted when the geese landed in the water. Also, a teal which had been jumped by a rafting party below Little Hole in the NRA was observed being "plucked" out of the air by a golden eagle. The ducks had been flushed by the party and were flying downstream when the eagle swooped over the raft and grabbed the duck (Chad Crosby pers. comm. 1975). Canadian goose broods on Flaming Gorge Reservoir are reported to incur predation by golden eagles (Verl Hanchett pers. comm. 1975).

Most of the eagles sighted in Sheep Creek Bay flew northward or returned from forays from the north. It is highly likely the eagles hunt the gradual dipping, north facing slopes which occur immediately adjacent to the precipitous cliffs where they nest, thus permitting the eagles to kill and carry the prey to the nest with a minimum of effort. This appears to be the most efficient use of the available terrain as hunting below the eyrie would entail a climb of 200 to 800 vertical feet just to gain the elevation of the nest. The large birds were seldom observed hunting below the nest. Whether this occurs is doubtful, as most of the nests are situated above water or narrow canyons which would be difficult for these birds to hunt successfully. If updrafts or favorable winds are present the eagles could conceivably hunt below the nest. However, much of the weather comes from the north and flows over the top of the mountains. Therefore, the most advantageous areas to hunt are those open areas directly north of the nest where the eagle can find a beneficial wind on which to soar carrying a rabbit up from 50 to 100 feet and then to descend over the cliff face back to the nest. The exceptions noted are that of the duck taken in front of a rafting party and the reported predation on Canadian geese on the reservoir. These may be unpaired or non-nesting individuals which are not committed to provide food for nestlings or a nesting partner.

After young golden eagles fledge, instead of more eagles sighted in the NRA there are less. Where do the eagles go when they disappear? The answer is unverified with sound data, but possible explanation of this anomaly is advanced here.

Golden eagles are currently filling most of the available cliffs. Nest sites appear to be a limiting factor in their population. The only available cliffs are found along the Green River and its tributaries, Henry's Fork and Black's Fork. These sites all appear to be occupied. Therefore the eagles nest in areas with good cliffs, but perhaps marginal hunting habitat. This is as suggested by their exodus once

the young have fledged and they are no longer burdened with nesting responsibilities. The country north of the state line is composed of low hills interspaced with grassy or dry scrub flats. While mammalian prey is abundant this country is practically devoid of good nest cliffs for hundreds of square miles. They have, to a certain extent, overcome this bottleneck, by raising young in one area and roaming for at least half a year in another. An intense study of the NRA, encompassing both Wyoming and Utah would either substantiate or refute this hypothesis.

Protection of the nest sites does not appear to be a problem as more are situated high above any disturbance. The few sites where problems may arise are under BLM jurisdiction in Antelope Flat and private ownership north of Manila. Eagles would be adversely affected if the spring and summer hunting habitat is permanently disturbed in some manner. This habitat falls under Forest Service jurisdiction in the Reaves and Glades area. Hunting habitat in Brown's Park and below the dam along the river does not appear in jeopardy as most is isolated by limited vehicular access.

If federal restrictions on predator control are liberalized, problems may arise in some areas. All the eagles nesting in the NRA and Brown's Park would probably be affected, however, some are much more vulnerable than others. These are the eagles nesting below the dam and east of the reservoir including all eyries sites in Brown's Park. As these birds forage in areas where sheep are grazed, they would be exposed to any control efforts. Consequently, any predator control proposed involving toxicants for the areas must be judiciously studied.

Bald eagle (Haliaeetus leucocephalus)

This large winter visitor can easily be distinguished by the white head and tail with a dark brown-black body. The legs are unfeathered and yellow in color as is the beak. The wings appear slightly longer and narrower than those of the golden eagle. The immature may pose a problem in identification as the body, head, tail, and wings are all dark brown with mottled white scattered throughout. Adult plumage is acquired in four to five years (Brown and Amadon 1968). Often positive identification of young is confused because of both bald and golden eagles frequenting the same area during winter, but the immature golden eagle can be distinguished by the definite white patches as opposed to the diffused white on the plumage of the immature bald eagle.

The bald eagle makes its appearance in Utah after the first of October and more commonly in the middle of November. In the Flaming Gorge-Brown's Park area bald eagles can be seen from December through March. Wintering bald eagles appear to move in north-south patterns while in the state.

While wintering in the Green River drainage, the bald eagle is closely associated with water. In the early part of winter, Red Canyon below the dam down to Indian Crossing is heavily used by bald eagles. Three survey trips through the canyon indicated this use is heaviest in January, tapering off in late February. Later in February and into the month of March the majority of the bald eagles can be found between Lucerne Valley and Antelope Flat Recreation areas.

Survey trips were made from Flaming Gorge Dam to Brown's Park. Bald eagles were the most frequently sighted raptor through Red Canyon. Perching birds, invariably were in dead trees or on dead limbs of ponderosa pines which extended out toward the river. There appeared to be no difference in whether the bird was an adult or juvenile. Most eagles observed soaring were high above the canyon walls.

| | <u>Mature</u> | <u>Immature</u> | <u>Perched</u> | | <u>Soaring</u> | |
|--------------|---------------|-----------------|------------------|--------------------|----------------|-------------|
| | | | <u>Limb Live</u> | <u>Status Dead</u> | <u>Low</u> | <u>High</u> |
| 12/28/75 | | | | | | |
| Bald eagle | 12 | 8 | | 8 | | 12 NR* |
| Golden eagle | 3 | | | | | 3 |
| 1/28/76 | | | | | | |
| Bald eagle | 10 | 2 | | 4 | | 8 |
| Golden eagle | 4 | 1 | | | | 5 |
| 2/26/76 | | | | | | |
| Bald eagle | 7 | | | 2 | 2 | 3 |
| Golden eagle | 1 | | | | | 1 |

*NR - Not Recorded

In Brown's Park mature cottonwood trees provide a roost for bald eagles. One site is across the river from Parson's Ranch. Seven adult and four immature eagles were observed using the roost in February, 1976. The eagles apparently fly into the roost during the last fifteen minutes of daylight and leave at the first rays of sunlight. The mature birds leave the roost in singles or pairs followed one-half to one hour later by the immature birds. All birds moved up stream after leaving their night time perch. Some alighted in trees as close as one-half mile above the roost while others continued up to the lower end of Red Canyon above Indian Crossing.

A second roost area was located at the mouth of Henry's Fork, also in mature cottonwood trees. Vegetation in the area is river riparian. This site is within the NRA boundary. Eagles using this roost move into the area in late winter as the population in Lucerne Bay increases dramatically when the bay freezes. Some bald eagles return to the roost area around noon. These may be individuals which had a successful hunt and are no longer actively foraging.

Three ecological niches were observed to be utilized by foraging bald eagles in the area. One niche consists of the Red Canyon area below the Flaming Gorge dam where the bald eagles actively hunt fish and waterfowl. Another niche is the Lucerne Bay area where waterfowl are primarily hunted. This bay is used by a large number of bald eagles only after it has nearly frozen over and waterfowl are concentrated in small areas of open water. The third and last niche observed to be used is the open plains area located north of the Utah-Wyoming state line and Antelope Flat. Clay Basin and parts of Brown's Park do not appear to be heavily used in this regard, but are included as occasional bald eagles are sighted hunting this area.

Hunting for ducks and geese occurs in the Green River Canyon during their respective seasons, October through December. Inept hunters leave many crippled and dead waterfowl and these play an important part in this eagle's diet. This source of carrion or easy prey probably exceeds the fare obtained from hunting and serves as the main attraction in the canyon. A month after the hunting season ends the bald eagles presence in the canyon decreases, which may reflect the decrease in this food source. A large population of ducks and geese remain, in fact have increased, indicated by an increase in the goose population observed on the river survey. The fish population of the river undergoes no appreciable decrease during this time. These situations indicate a large reliance on man-caused dead and injured waterfowl available within the canyon.

The waterfowl found below the dam while not hindered by limited open water are still confined between the walls of a narrow canyon. This acts to concentrate and funnel the birds and no doubt increases the bald eagle's chances when hunting this area. On every survey trip through Red Canyon, hundreds of ducks and geese were seen. Puddle ducks such as mallards, teal and gadwalls are not as encumbered in escape as are the diving ducks, bluebills, golden eyes, and buffle heads.

When the wind was blowing down stream the divers had to take off by flying past the dory. The eagles may take advantage of this limitation and hunt into the wind catching these ducks as they flush. Geese are also at a slight disadvantage due to their large size and slower exit from water or shore. It is upon flushing that both groups of waterfowl find themselves most vulnerable.

Fish are also used by bald eagles in the canyon. The eagles use snags to perch and observe the river. When a fish is sighted the attack is launched from the perch. A wing beat or two followed by a glide into the water and the bird returns to the perch, if successful, with a fish, or if unsuccessful to wait for another opportunity. The percentage of fish in the diet of the bald eagle is not known, but they are a part of its winter fare.

A decrease in the Red Canyon bald eagle population corresponds to an increase in the bald eagles seen in Lucerne Bay. During February and March they can be observed perched on the ice and chasing coots along the south west side of Lucerne Valley. They are very adept at procuring this ample source of food. When a flock of coots is located, the large eagle will dive upon the flock which causes them to scatter. They then follow an individual bird as it swims underwater, diving on it whenever it surfaces. The clear water of the bay is important to the eagle as it relies on keeping the diving bird in sight while it is swimming under the surface. When the coot finally is exhausted and surfaces for good the eagle swoops in and plucks the bird from the water. It then flies off to solid ice where it devours its catch. The eagles also chase ducks while in this area, but the larger number of coot influence a predilection for them.

Highway surveys run from Manila to Black's Fork in February and March indicated bald eagle use of open country. In February, thirteen bald eagles were observed along this route. However, by mid-March the population had declined and only one immature bald eagle was sighted. Most of the eagles were flying when observed. The eagles sighted on the ground were perched on low knolls within 200 yards of the highway. As large cliffs or trees are non-existent in this area, the knolls offer the only elevational advantage available to the perched bird.

Potential prey in this area includes prairie dogs, cottontail rabbits, jack-rabbits, antelope and domestic sheep. Carrion composed of these species is found along the highway. Platt (1976) suggests that road and hunter-killed animals form

a major portion of desert wintering bald eagles' diets. Although bald eagles have the ability to hunt and take healthy prey (Edwards 1969), they apparently prefer the more easily obtained dead and injured animals along the road.

In late spring bald eagles were frequently encountered between Minnie's Gap and the reservoir hunting Antelope Flat. Between December and early February no bald eagles were observed in this area.

Bald eagle roosts in Brown's Park and Henry's Fork should be protected from destruction. Platt (1976) noted that bald eagles prefer specific trees and limbs and return yearly to them. Although tolerant of some human disturbance, roost areas would be ameliorated by a reduction in traffic in the immediate vicinity. The roost in Henry's Fork is within sight of Highway 43, however, the moving traffic does not appear to disturb the eagles. In Brown's Park a minor dirt road paralleling the river comes within one hundred feet of the roost. This road, while not heavily used, should be closed between January and March to prevent a motorist from inadvertently flushing the birds or preventing them from coming in at night.

Snags or deciduous tree species appear to be preferred by bald eagles while perching during the day or while hunting. In surveys of the river, bald eagles were invariably observed perching in a deciduous tree, a dead conifer or on a dead limb of a live conifer. Live conifers and branches with their additional foliage may hinder a large raptor such as the bald eagle when landing or leaving a perch. Immature eagles with less flight experience and skill may be relegated to fairly large dead limbs devoid of smaller branches. Snag removal policies should be re-examined and if removal is necessary must be executed with the bald eagle's preference considered.

Osprey (Pandion haliaetus)

Ospreys are large, light colored hawks usually found near water. The wings are long, narrow, and have a conspicuous crook at the wrist. A dark patch is obvious at the carpal joint. The osprey's legs are long, with feet that have a reversible toe and sharp spines, adaptations for carrying slippery fish (Brown and Amadon 1968). The head is light in color with a distinct dark broad stripe running through the eye. The upper parts of wing and body are dark in color while the wing undersides, abdomen and legs are white. The tail is broad and faintly banded. Ospreys are sometimes confused with the bald eagle owing to the light colored head and large size of both birds, but the bald eagle has an all white head and tail with wing and body dark both above and below.

Ospreys are migratory raptors that summer in northern states and Canada and move south in the winter. Henny and Van Velzen (1972) deduced from band returns that South America (Ecuador and Columbia), is the winter grounds for ospreys summering in the western states. In Utah, ospreys appear in late April and early May. Small lakes in and near the NRA are visited prior to returning to nest sites. After moving their activities to the reservoir they select and refurbish existing nests and begin nesting duties. In late August or early September adult and juvenile birds begin their migration to South America. At this time osprey sightings are frequently reported from the lakes of the high Uintas and at various impoundments throughout the state.

Ospreys nest in the NRA on rock pinnacles found in Horseshoe Canyon and north of the Flaming Gorge Dam. They are not now known to nest in any trees along the impoundment. Prior to the impoundment ospreys were reported to nest in yellow pine trees along the river, (Rod Stone pers. comm. 1976). The pinnacles used are all isolated from the main cliff by large cracks or erosion. Horseshoe Canyon has seven nest sites, six of these on pinnacles, on the outside curve of the river, and one located on a ledge overlooking the water. There are two old nests across from the southeast point of Kingfisher Island. Old vegetation and condition of these nests suggests inactivity for the past four or five years. A quartzite pinnacle directly north of the dam and no more than two hundred yards from the dam viewpoint also supports an active nest. This nest is known to have been active for the past three years.

Nests were constructed of pinyon and cedar twigs, seldom over a half inch in diameter. Some green boughs of cedar were scattered on the nest perimeter. The nest lining was shredded cedar bark and down. The two nests visited measured four feet in diameter and were four and six inches deep.

For this report the osprey nests have arbitrarily been numbered from one to ten, starting from the dam and moving up stream to the upper end of Horseshoe Canyon. The majority of osprey nests are in inaccessible locations which prohibits scrutiny. However, the nest nearest the dam (#1) lends itself to observations as it sits below a high cliff, from which young could be observed and counted. The nests in Horseshoe Canyon can only be observed with difficulty. A helicopter flight

was therefore used to obtain information on productivity. Nestlings were also observed from the boat; they were seen peering over the edge of the nest with an adult present.

Young were observed in all six of the nests occupied in mid-July. Four young were in the nest near the dam (#1) and two young in the nest near the upper end of Horseshoe Canyon (#9). The other four nests were observed to have at least one nestling, but due to their inconspicuous coloration were not accurately counted from the air.

These six nestlings were banded in 1976. The four in the nest near the dam were banded on July 13th and the two in nest #9, on July 15th. At this time, they appeared to be five and six weeks old, respectively. Ospreys fledge approximately eight weeks after hatching, (Stotts and Henny 1975), (Brown and Amadon 1968) and (Bent 1937), and banding did not appear to jeopardize the birds. To facilitate easier handling the birds could be banded two to three weeks earlier (Reese 1970), but no later than six weeks as was done this past year. A later visit to the overlook above nest #1 revealed all four young in apparently good health and later all fledged.

Ospreys are more tolerant of human activity than most raptors and may nest in close proximity to homesites (Bent 1937). The nests in the NRA are all within view of fishermen and boaters. Horseshoe Canyon has considerable boat traffic from early summer through Labor Day. The osprey while conspicuous in flight and very vocal when the nest is directly approached, often remains unobserved by the majority of the recreationists. While incubating and later while brooding, the crouched adult stays hidden below the nest rim and only careful observation reveals the white head just above the rim. The mate is usually seen perched in a pinyon snag near the nest, but unless the nest is directly approached remains silent. The large amount of boat traffic in Horseshoe Canyon may prevent the osprey from fishing in this area as no fishing attempts were observed in the canyon.

Osprey exist almost entirely on fish. The reservoir contains this staple in quantities suitable to sustain a fair osprey population. On a large body of water osprey predation has little effect on fish populations as only a small percentage of available fish are used and normally this predation is spread over two or three species (D. S. MacCarther 1972). Fish swimming on or within two or three feet of the surface are subject to predation by the osprey. When hunting they usually

course back and forth over an area. Upon spotting a vulnerable fish, attack may come immediately or be preceded by momentary hovering. The osprey then drops into the water with wings held high and feet extended. Ospreys have been observed to take two fish on such a plunge (Veoka and Koplín 1972). They are very efficient, having between 80 and 90 percent success in their fishing efforts (Lambert 1943, D. S. MacCarther 1972, and Garber 1972).

Areas used by the osprey for fishing excursions were mainly on the reservoir. The bay formed by Dutch John Draw appeared to be extensively used by pair #1. On several occasions osprey were observed in the vicinity carrying fish of 10 to 14 inches in length. A second pair of osprey was observed in the area also with fish in late June. The Jug Hollow-Spring Creek Bay area was also fished by a pair of adults accompanied by what appeared to be two juveniles. A lone osprey was also observed flying near the mouth of Black's Fork. Several private ponds within or adjacent to the NRA were also utilized. These included a pond which does not contain fish and a number of large ponds stocked with trout. The former is visited infrequently by osprey during the summer months. Frogs (Rana pipiens), crayfish (Canbarus spp), and salamanders (Ambystoma tigrinum) are found in the pond and although not actually observed being taken, osprey have been observed diving into the pond in a hunting effort (C. Bown pers. comm. 1976). The ponds stocked with trout are subject to predation in early April. The osprey prey on the stocked fish until moving down to the reservoir. Although two nests were visited no identifiable prey remains were found.

Ospreys are very aggressive toward turkey vultures soaring near active nests. On several occasions encounters were observed. Antagonistic flights consisted of diving at and chasing the large scavengers. In Horseshoe Canyon, the vultures have several roosts in close proximity (within 250 yards) to three of the active nests. A red-tailed hawk nesting in the canyon was not observed to be harrassed by the ospreys.

The osprey population in the United States has been declining since the late 50's and early 60's. This has been very evident in the eastern part of the United States where, with the exception of Florida, most populations have been reproducing at rates below that needed to maintain themselves (Henny and Ogden 1970). The

western osprey populations generally appear healthy. Swenson (1975) found a reduction in the osprey population in Yellowstone National Park, but other western researchers noted reproduction above replacement rate (Henny and Wright 1969, Melquist 1973, Garber 1972, Lind 1971, and Koplín et. al. 1971).

Historical data from the NRA is scanty. Twomey (1942) noted osprey nesting in the Uinta Mountains, but not along the Green River, although a mid-September survey camp was located at Green Lake. White and Behle (1960) found two nests, each containing two young, in Horseshoe Canyon prior to the impoundment. In 1970 only one nest was known to be active at the mouth of Sheep Creek and Kingfisher Canyon (one of the previously mentioned two old nests still in the area) and fledged two birds (U. S. Forest Service field notes, Manila district). In 1971, three nests were active and again each fledged two birds. In addition to the Kingfisher Canyon nest two more were reported in Horseshoe Canyon (ibid). Records on nest #1 are non-existent until 1974 when it was reported active (Verl Hanchett pers. comm. 1975), but the number of young fledged was unknown. More information is needed on osprey productivity in the NRA before any valid conclusions on the status of the population can be ascertained. The limited data found to date indicates above average productivity and an increasing population.

To increase the data on osprey productivity, plans are underway to place permanent climbing bolts on the sandstone pinnacles where they now nest. These would be placed in inconspicuous locations away from the public's view and would take place prior to the ospreys' return. These anchors would facilitate banding and accurate counts of young on the otherwise inaccessible nests.

Nest sites in the FGNRA at present do not appear to be limiting the population. There are unused nest structures and pinnacles scattered along the reservoir. A new nest was constructed within the past two years in Horseshoe Canyon. In the mid-May survey a pair appeared to be loosely attached to this site but by mid-July they had abandoned the area. Some habitat modification in the form of tree topping could conceivably draw some birds into new locations. Most notable of these would be the areas along the Green River below the dam and downstream from Little Hole. Ospreys are not currently using this portion of the river and perhaps a little encouragement in the form of tree topping would induce them to use

this area. As osprey are incubating and hatching young during the first two weeks of June they may be unable to adjust to the pressure when the general Utah fishing season opens on the first weekend of June. A sudden influx of people in areas with previously light use has a greater impact than on areas of constant human disturbance (Swenson 1975).

Ospreys seem to co-exist with the recreational activities within the NRA. However, recreationists may have caused the abandonment of the two nest sites at the mouth of Kingfisher Island. There is a boat camp within a half mile of these nests. This camp may have affected the nests to a minor extent, but mooring or fishing within this area would be much more deleterious to the birds nesting as these pinnacles are lower than the structures in Horseshoe Canyon. Swenson (1975) found that where boating traffic is heavy the osprey were less disturbed than in areas less frequently used. This tends to corroborate the observations in Horseshoe Canyon as opposed to the nest #1. Ospreys on this nest which is removed from most boat traffic, became very agitated when approached by boat. Both adults would fly back and forth, landing on nearby snags and screaming constantly while the boat was in the nest vicinity. The nests sites in Horseshoe Canyon apparently co-exist with little difficulty with the heavy boat traffic. The two pinnacles in Kingfisher Canyon might be protected with a marked zone within which boating and fishing would be prohibited. The boating per se does not adversely affect the birds, but the associated activities, i. e. stopping, water skiing, mooring etc., have detrimental affects on the low nests (less than 40 feet high).

Summary

Osprey are large fish eating raptors common in the NRA. At the present time at least six breeding pair and two or more non-breeders are using the area. The Flaming Gorge impoundment has enhanced their habitat in this portion of Utah. Known nests are all on pinnacles. All but one of these is found in Horseshoe Canyon. Few historic records exist of osprey populations in the area prior to the impoundment. The population and production should be monitored yearly. Permanent bolts in the sandstone pinnacles will aid accurate production figures and banding in the future.

Comparison of recent osprey nesting at various western U. S. and Canadian locations

| Location, Year Reference | Year | No. Active Nests (A) | No. Young Fledged (F) | Productivity (F/A) |
|-----------------------------------------------|--------------|-------------------------|--------------------------|-----------------------|
| Yellowstone Park (Swenson 1973) | 1973 | 33 | 29 | 0.88 |
| NE California (Garber 1972) | 1970-71 | 87 | 99 | 1.10 |
| Crane Prairie, Ore. (Lind 1971) | 1971 | 52 | 60 | 1.15 |
| Flathead Lake, Mont. (Koplin et. al. 1971) | 1970 | 23 | 31 | 1.35 |
| N. Idaho & NE Wash. (Melquist 1973) | 1972 1973 | 153 189 | 192 289 | 1.25 1.53 |
| British Columbia (Kemper & Eastman 1970) | 1970 | 19 | 21 | 1.1 |
| Flaming Gorge NRA, Utah (this study) | 1976 | 6 | 6* | ----- |

* Known fledged from two nests, four other nest inaccessible.

Hen Harrier, Marsh hawk (Circus cyaneus)

This small to medium sized hawk is a year round resident of the study area. The tail is long and narrow, with narrow banding. When hovering, the tail is widely flared. A distinct white patch is visible on the rump at the base of the tail. The marsh hawk's feet are small and it's long legs are unfeathered. The body is slender and the head is small with a partial facial disk. Females are larger and more colorful than males. The female has brown to rufous brown plumage. Males appear very light on undersides of body, wings and tail, and the wing tips have distinct black tips. The upperside of the male is light grey in color. The eye of adult birds is yellowish with a yellow cere and legs. Immature plumage is much like that of the female. The immatures also have brown eyes, greenish ceres, and yellowish feet (Brown and Amadon 1968).

The marsh hawk is a ground nester utilizing cattail marshes, wet grassy swales, high uncultivated grass along the perimeter of hay or grain fields and stands of high grass within sagebrush flats. Old ungrazed or untrampled grasses and rushes that remain standing after winter snows have melted provide the type of cover this hawk needs for nesting. The nest is built mainly by the female. However, the male may contribute a little in some pairs. Nests are built of local vegetation, cattail stalks, grass, rushes, and small branches. The nests are from twelve to twenty inches in diameter and vary in height depending on the locations. Bent (1937) cites examples of low nests being built on the ground, two to three inches in height, while nests in wet or swampy areas were as high as eighteen inches. They are reported to nest in close proximity to each other (Brown and Amadon 1968), however, no examples of communal nesting were found in either the NRA or Brown's Park.

The male harrier is very acrobatic in the spring, wooing his mate with a series of steep dives and climbs with a roll at the apex of each one. The female may also participate in these acrobatics after pairing, (Brown and Amadon 1968).

Eggs are laid over a period of two weeks. The female may begin incubation after the second egg is laid. Clutches vary between four and six eggs. During incubation and early brooding the male does most of the hunting although the female may hunt for short periods (Brown and Amadon 1968).

Harriers can be seen hunting during morning and evening hours. They harry small animals by systematically flying back and forth across grassland-marsh areas. A few wing beats followed by a glide with wings held high over the back (very similar to a turkey vulture's wings while soaring) is their characteristic mode of flight while actively hunting. Harriers have exceptionally large ear openings for a diurnal raptor. This is suggested to augment their keen eyesight in locating prey rustling among the thick vegetation (Brown and Amadon 1968). When prey is located the harrier may drop quickly or hover momentarily before diving upon it. They also spend some time perching on the ground, on low fence posts, and old tree trunks. They were never observed to use trees or utility poles as perches although Brown and Amadon (1968) report this activity.

Harriers prey on small rodents, small to medium sized birds, frogs, lizards, snakes and insects. They have also been observed feeding on wounded and dead ducks left by hunters. A magpie was seen taken in a trench silo by a harrier which surprised the bird while feeding. Snakes were observed as prey items on several occasions in Brown's Park. Rodents make up between 55 percent and 70 percent of the diet (Brown and Amadon 1968).

No harrier nests were located, although they nest in both the NRA and Brown's Park. Three areas of harrier activity were noted in the Park; the lower end of the hayfields southeast of Crouse Canyon, across the river from the refuge headquarters, and across the river from Parson's Ranch. Jug Hollow had a pair of harriers using some high grass approximately 100 feet above the high water line of the reservoir. There are more harriers nesting in both areas, but they were not actively sought and consequently not recorded.

Summary

Harriers need areas of medium to high vegetation to nest. Over grazing can eliminate nesting activity as effectively as shooting the birds. Some areas of high grass should be left undisturbed along the edge of the reservoir. Brown's Park contains many areas along the river and scattered throughout the refuge where grazing has been eliminated or physically isolated and mature stands of grass provide nest sites. At the present time harriers appear to have good nesting habitat available in both the NRA and Brown's Park.

Genus: Falco

Small to medium sized raptors, with long pointed wings, narrow tails and slender bodies distinguishes the falcons from other raptors. The beak has a distinct notch that is thought by some to aid in the coup-de-grace given to its victims (Brown and Amadon 1968). The nostrils are ovate while those of most other birds of prey are elliptical. The cere and feet of immature falcons is blue-green becoming bright yellow in adults.

Three of the species found in the state exhibit a dark 'moustache' mark below the eye. Both sexes are known to have a brood patch and both parents incubate. As with most other raptors, females are larger than the males. Eyries are found on cliff ledges, old stick nests and in holes in trees and cliffs. They do not build nests, but simply make a depression (scrape) with their bodies in the hole or on the ledge.

American kestrel or sparrow hawk (Falco sparverius)

The kestrel is the smallest falcon in Utah, approximately robin-sized. The male is slightly smaller than the female, but is much brighter in coloration. Both sexes have rufous colored backs and tails, but the male has a uniformly rufous tail with a dark terminal band while the female has a prominently barred tail. The male also has a blue-grey shoulder that is conspicuous when perched. Both have dark "eye spots" on the back of the head with a rufous patch on the crown. Both have a dark stripe extending down below the eye. The feet are small, but strong enough to capture and carry small birds and rodents. The wing beat is deeper than the other falcons and when alighting, the kestrel has a characteristic tail wag or bob that may aid in separating it from merlin falcons during the winter months.

Kestrels use holes in trees, cliffs, buildings, and dirt banks for nesting. Old woodpecker holes in dead snags and small pot holes in rock walls are preferred. The holes used in rock walls are often identified by the white washing extending below the cavity. Kestrels may be located in wood lots only by patient observation. Once a nest tree is found the parents become quite agitated and protest vociferously.

Kestrels nest throughout Utah. In Brown's Park and the NRA they were observed nesting in small holes in cliffs in the Spring Creek and Reeves areas, and in Swallow Canyon. Kestrels were frequently encountered along Taylor Flat in

pinyon-junipers where the adults noisily protested, but no actual nest was located. There were at least two pair in this area.

Kestrels hunt large insects throughout the summer. Grasshoppers often play a large part in their diet from mid-summer to the first freeze. During winter and spring months, mice and small birds are utilized. The Craigheads (1956) found mice made up 70 percent of the kestrel's summer diet. In the same study small birds accounted for slightly over 19 percent of their food. No percentages were given for insects during this same period.

Kestrels hunt from a perch or while flying. Hovering is commonly observed as this bird flies back and forth over an open field or pasture. They may attack directly from a perch, from flight, or after hovering and successive periods of stationary flight analogous to descending a staircase. Most prey is seized while on the ground, however, insects and some birds are captured while in flight. They tolerate man's activities quite well and will nest in close proximity to developments or heavily used areas. Farms and rural areas often are attractive to small birds and the kestrel is likewise a common visitor to these surroundings.

Kestrels are birds of moderately open areas. Kestrels are not found deep within dense forests, but may nest along the edges. Nesting ranges are small. Craigheads (1956) found home ranges to vary from 0.7 to 2.3 miles in diameter and varied in area from .16 to 1.93 square miles. Smith and Murphy (1973) found .31 square miles to be the average home range in 1969 and .26 square miles in 1970.

At the present time the kestrel is one of the most common raptors found in the northeast corner of Utah. Twomey (1942) reported the bird common in the Uintah Basin and collected specimens at Green Lakes. He (ibid) also reported a preference for wooded river valleys and saw the birds feeding over the edge of arid bench lands adjacent to river valleys.

This colorful and fairly tame bird is known to use nestboxes (Hamerstrom 1973). Kestrels could be induced to use more of the camp grounds if nest structures were made available. Olendorff and Stoddart (1974) present an example of an artificial nest structure, the figure could be modified simply, erected cheaply, and would serve to attract this colorful little falcon to some of the more barren camp grounds in the area (figure in Olendorff and Stoddart report).

Merlin, Pigeon hawk (Falco columbarius)

The merlin is a small, pigeon-sized falcon. It is slightly larger than the kestrel. It appears as a dark falcon without any distinguishing facial marks, and the tail is noticeably barred. Merlins fly with rapid wing beats and seldom soar. They can be found perching in trees from which they hunt small birds.

Starlings appear to be a favored winter prey for the merlin. They aggressively hunt these birds while on the wing. Farm yards and pastures where cattle droppings and spilled food attracts starlings and sparrows are frequently hunted by the merlin.

Four subspecies are reported to occur in Utah. They are F. c. bendirei, F. c. suckleyi, F. c. columbarius and F. c. richardsoni (Behle and Perry 1975). The most common form found is F. c. richardsoni (Steve Chindgren pers. comm. 1976).

The merlin is not known to breed in Utah. They are classed as uncommon transients by Behle and Perry (1975) and are found in the state between August and February. Twomey (1942) reported individuals along the Green River near Jensen in May and in September. Although not observed in the area they undoubtedly move through and may winter in both Brown's Park and the Manila area of the NRA. More observation around the farms, old homesites, and stands of deciduous trees during the winter months would verify this assumption.

Prairie falcon (Falco mexicanus)

The prairie falcon is a medium sized raptor. The typical falcon characteristics, long pointed wings, narrow tail, slender body are all present in this swift flying bird. Prairie falcons are brown or tan above, the undersides are light colored or whitish, with dark spots on the white feathers of the breast. The immature has dark stripes on the breast and consequently the breast appears darker than that of the adults. The head has a light eye strip, with dark markings on the back. Under the eye is a narrow, dark brown, vertical moustache mark. Besides the light coloration, dark or black axillars (found under the wings at their junction with the body) differentiate the prairie falcon from the peregrine falcon which it resembles in silhouette and size (Robbins, et. al. 1966).

The prairie falcon is generally known as a bird of the open plains. They are frequently found in arid dry scrub prairies. Winter habitat in Utah has been described as, 'dry-farm wheat lands and grassland flats', (White and Roseneau 1970).

They are, however, reported to frequent tundra-like habitat in the high mountains of Colorado (Marti and Brown 1975). Prairie falcons have the ability to utilize a much more arid environment than their rare congener, the peregrine falcon (Porter and White 1973).

In the NRA, prairie falcons were considered the most common raptor prior to the impoundment (White and Behle 1960). Eight eyries were located and from the descriptions rendered, apparently were all north of the Utah border in Wyoming. The topography and habitat of this area is high rolling plains, intersected by the Green River with low desert scrub intermixed with prairie grasses.

The Flaming Gorge reservoir now fills the former river valley. Low cliffs, less than twenty feet high are found north of Lucerne. The cliffs gradually become higher until north of the Black's Fork confluence the reservoir is contained between walls over two hundred feet high. Prairie falcons are still present as indicated by a May, 1976, survey when four active scrapes were located in this area.

In the Utah portion of the NRA, prairie falcons are not uncommon, but are much more difficult to find and assess the status of their eyries. At least two, and possibly three active eyries, were located in the Utah part the past summer. Two of the eyries where prairie falcons were frequently seen were along the long wall that extends from Sheep Creek to the Flaming Gorge face. A prairie falcon was also sighted in Kingfisher Canyon. The bird flew out of a narrow canyon and sailed over the top of the ridge toward Bear Top. Closer inspection of the canyon revealed a perch and possibly an eyrie site. The two former sites were also surveyed from helicopter which verified the recent falcon activity. At least two other areas appeared favorable to prairie falcons. The cliffs along the north side of Spring Creek appear to have had prairie falcons use in previous years due to old mutes found along favorable ledges and horizontal cracks. A cliff which appeared to have an old scrape was located in a small wash west-northwest of Dutch John Gap. It overlooks Antelope Flat and is relatively free from disturbance.

Brown's Park, while appearing favorable to the prairie falcon with sheer walls and open hunting habitat in the vicinity, did not have any apparent large falcon activity. No prairie falcon sightings were recorded in the Park. Cliff areas which appear to satisfy prairie falcon eyrie requirements are found in Swallow Canyon, Sears Canyon, Crouse Canyon, cliff faces above Birch Creek, and west of Home Mountain

above Red Creek. Swallow Canyon's walls were repeatedly surveyed and the cliffs closely inspected by rappelling. Hunting habitats are also located in close association to these cliff sites.

Prairie falcons hunt by several methods. They are commonly seen flying at altitudes of one to several hundred feet from which their excellent vision can locate low flying birds or terrestrial prey. A dive or stoop is used to produce the energy needed to shock or kill the victim on contact. Prairie falcons seize their victims in the air or hit with force enough to disable and bring the animal to the ground. They alight on the stunned animal and seize the head or neck in their beak and kill it. While most raptors kill with a "death grip" of piercing talons, the falcon uses its beak to accomplish the same result. Falcon kills can be distinguished by their habit of feeding on the head prior to moving to other parts of the body. Fur and feathers are consumed in moderate quantities, guaranteeing a substantial pellet later. They may feed on the location of the kill or carry it to a perch with a vantage point. If the kill is carried, it is inconspicuously held close to the body which may reduce pirating from other raptors.

Perches are frequently used by prairie falcons, especially during winter months. They both hunt and feed from these elevated positions. Old snags on the periphery of extensive forests, overlooking open areas may determine whether the area is hunted or not by the falcons. In the absence of snags, steel towers and wooden utility poles are commonly occupied. This is particularly true during winter and other non-breeding times when their regurgitated pellets may be found littering the bases of these structures.

A variety of small to medium sized birds and mammals are preyed upon by the prairie falcon. The Craigheads (1956) found 80 percent of prey items to be mammalian, the remaining 20 percent avian. Of the mammalian prey, 62 percent was composed of meadow voles and 18 percent Uinta ground squirrels. Porter and White (1973), however, report 61 percent mammals and 39 percent avian. Uinta ground squirrels made up 90 percent of the mammalian prey. Prairie falcons are reported to take advantage and concentrate their efforts on local abundant prey. They respond to ground squirrel population irruptions, and at times feed exclusively on these small mammals. In addition, individuals within a population may have attained more ability to capture a particular species and consequently their eyries reflect this tendency in prey remains (Bent 1938).

Avian prey consists of mourning doves, black birds, flickers, horned larks, and mountain blue birds. Additional mammalian prey is composed of chipmunks and voles.

Hunting areas, while not observed, may be postulated to be the dry scrub habitats found in Antelope Flat, Bear Top, Reaves and the Glades; Brown's Park contains similar habitat. White and Behle (1960) reported Brewer's blackbird, lark sparrow and sage thrasher as prey commonly found in the diet of prairie falcons.

Hunting territories are maintained by a pair during nesting season. The Craigheads (1956) report the falcons to have separate, non-overlapping hunting ranges. This to a certain extent corroborates the NRA observations of flight direction of the different pairs.

Prairie falcons nest exclusively on cliff faces. In the NRA all occupied falcon eyries were located in the top quarter portion of the cliff. They are known to use low cliffs, but none were found in the area. At this time all occupied falcon eyries are relatively undisturbed. Maintaining these undisturbed sites is critical to the prairie falcon's nesting requirements.

Prairie falcons are sensitive to human disturbance prior to egg laying. If disturbed during this period nest desertion might well result (Fyfe and Olendorf 1976). Once eggs are laid and incubation progresses, the parents become more tenacious of the eyrie. During incubation and brooding they will sit tight. Flushing at this time may break or inadvertently throw eggs or young from the nest (ibid). Contacts or exposure to people should therefore be avoided, especially during nesting. Trail or campsite development above or below eyrie sites would decrease the site's potential production.

Summary

White (op. cit.) considered prairie falcons the most abundant raptor species in the area prior to the impoundment, although most eyries were indicated to be north of the Utah border. At present, falcon eyries are found along the wall north east of Sheep Creek to Lucerne Bay. Kingfisher Canyon may also have a pair. A possible eyrie is located east of Dutch John Gap, but no falcons or recent sign was located. Habitat in Brown's Park appears favorable to this species, but no eyries or

or sightings were made in the area. Nesting and hunting areas do not appear to be limiting factors in the NRA. Encroachment by recreationists in the Spring Creek Bay area may have restricted or cause abandonment of former eyries in this area. Nesting and hunting areas do not appear in danger of development. A paved highway now under construction from Dutch John Gap to Minnie's Gap in Wyoming should not adversely affect the falcons. Construction of artificial perches may enhance some of the expanses of Antelope Flat to prairie falcons, however, these should be relatively inconspicuous to vehicular traffic.

Peregrine falcon (Falco peregrinus)

The peregrine falcon is a medium sized falcon. Its body and wings are slate grey above with a light breast with dark spots. The wings have dark blue-grey barring with the wing linings more densely barred. Immatures tend to be dark brown with dark streaking on the breast. The head of the adult is dark, almost black, with a distinct hood or moustache from the crown to the neck. Feet and cere of the adult are bright yellow while the immature peregrine has blue-green feet and cere.

Peregrine falcons were not recorded in White's (1960) preimpoundment study. Two sightings in the NRA were reported by Wyckoff (1975). In the report a peregrine was recorded in Lucerne Valley, and Mike Perry (pers. comm.) made the other observation in the vicinity of Sheep Creek and U. S. 44. Perry's sighting was in late July or early August. No other peregrine falcons were sighted. A Wyoming Fish and Game biologist (Jim June pers. comm.) reported an active eyrie in Wyoming on or near the Green River.

Nesting habitat preferences of the peregrine falcon are similar to those of the prairie falcon, however, some differences between the two species may delineate specific critical habitat. The peregrine falcon prefers a moister climate than its congener (Porter and White 1973). They are also considered the specialist of the air, preferring avian prey over all other forms. Seldom are mammals taken (Brown and Amadon 1968). They are adept and appear to prefer capturing prey while airborne. The peregrine is commonly referred to as the "Duck Hawk" indicating a preference for this fare as well as the marshes where this prey may be found. Many shore birds find their way into this falcon's diet. This propensity has led some researchers to delineate critical nesting habitat for the peregrine falcon as cliffs

adjacent to a marshland or water way where suitable numbers of prey are found (Porter and White 1973). Using this criteria many areas of the NRA and Brown's Park would qualify. Brown's Park has cliffs in close proximity to waterfowl marshes which appear at least superficially to fulfill these requirements. However, the birds have not been observed in the area.

The peregrine falcon is on the FWS endangered species list. This dubious honor indicates a need for more knowledge about the bird, its habitat needs, and an accurate inventory of existing birds. The northeast corner of Utah appears to have the necessary habitat and occasional falcons are sighted in the area. Field personnel should therefore be familiar with this bird's description. Any sightings in the area should be reported immediately to the Division of Wildlife Resources.

Gyr Falcon (Falco rusticolus)

This largest member of the genus Falco is occasionally seen in northern Utah during the winter months. It is a bird of many color phases from dark, almost black, to snowy white. It is falcon shaped, but with a heavier body and wider wings. It does not have a distinct facial mask. In January, a gryfalcon sighting was reported in the NRA (Clay Perschon pers. comm. 1977). Movements into Utah may coincide with snowy owl invasions of the area.

Owls - Order Strigiformes

Owls are an important component of the raptor population of Brown's Park and the NRA. Although seldom seen due to their nocturnal habits, they may be as numerous as their diurnal counterparts. Five species of owls were sighted, heard or reported using the area. They are the great-horned owl (Bubo virginianus), saw-whet owl (Aegolius acadicus), pygmy owl (Glaucidium gnoma), long-eared owl (Asio otus), and burrowing owl (Speotyto cunicularia). In addition, four other owls may use the area. These include the screech owl (Otus asio), the short-eared owl (Asio flammeus), the flammulated owl (Otus flammulus), and possibly the spotted owl (Strix occidentalis). Snowy owls (Nyctea scandiara) may rarely visit the area in winter.

Owls are easily distinguished from other raptors by the following characteristics: a large head on a short thick neck and the face is outlined by a facial disk of small feathers, large eyes adapted for acute night vision, these are set into the skull and are immobile, which causes owls to turn, raise, or lower the entire head to see in different directions, extremely acute hearing related to asymmetrically

shaped ear cavities, feathers of the head in some species which can be erected to form "ear tufts", silent or almost soundless flight made possible by sawtoothed leading edges of outside primaries and the generally soft texture of the flight feathers and body plumage, hooting or calling at night by many species. In addition to the above characteristics, most owl species exhibit reversed sexual dimorphism, i. e., the female owl is much larger than her male counterpart.

Hunting habitat and prey preferences of the four owls located in the area superficially appear to overlap. However, subtle differences apparently segregate them into separate ecological niches. Prey as large as young cottontail rabbits (Sylvilagus spp.) are reportedly taken by the pygmy owl (Karalus and Edkert 1974) the smallest owl found in the area. While the great-horned owl, which takes a large number of cottontail rabbits, also takes a goodly number of deer mice (Peromyscus spp.), and item frequently encountered in the diet of the pygmy owl. Long-eared and saw-whet owls fall into the mid-spectrum of the size range and also exhibit a predilection to deer mice. Gause's rule of competitive exclusion is not, however, being violated. Upon close inspection it is found the pygmy owl is more diurnal, the saw-whet nocturnal and forest loving, the long-eared also very nocturnal hunts open country and from the wing, while the great-horned owl spends most of its hunting time perched and in taking a greater diversity of prey (Marti 1974).

Great-horned owl (Bubo virginianus)

The great-horned owl is the largest owl encountered in the NRA and Brown's Park. It has a short thick body, long broad wings, and when viewed in flight almost appears to have no neck. It is a strong, powerful, yet amazingly agile flyer (Eckert 1974). They are usually grey in color, however, they may vary from almost silver to a grey-brown appearance.

Great-horned owls were encountered throughout both areas. White (1960) indicated it as common, and recorded three nests in cliffs still occupied by the owls. In the May, 1976, cooperative raptor survey, nine nesting areas were located in Wyoming. All were found in low cliffs under overhanging rocks or in cracks. Fourteen adults and twelve young were counted at this time. In addition, a nest site was located between Dutch John Gap and Antelope Flat. Owls were sighted randomly from Brown's Park through the Utah portion of the NRA.

Great-horned owls use a variety of nest sites. In this area they were mostly found in rock crevices and on ledges under overhanging rock. They are also commonly found using tree nests previously constructed by red-tailed hawks. As the great-horned owl may begin nesting as early as late December they have the pick of the nest areas without competition from other raptors which nest later (Craighead and Craighead 1956).

Cottontail rabbits are one of the most utilized prey items in some areas. Marti (1974) found cottontails to comprise the major portion of the prey biomass varying from 48 percent to 62 percent over a three year period in north central Colorado.

Long-eared owl (Asio otus)

This medium sized owl in some respects resembles the larger great-horned owl. Upon inspection, however, the ear tufts appear longer and set closer together than those of the larger owl. Its facial disk is likewise distinguishing from that of the great-horned owl. The disks are long, orangish in color and almost meet at the throat. The body is long and slender. This shape is fairly inconspicuous in the dense forests this owl inhabits and the owl may escape notice by remaining silent and passing as a part of a dead snag upon which it often spends the daylight hours. The wings are long; Marti (1974) found the long-eared owl to have the lightest wing loading of four species studied (barn owl, genus specie, burrowing owl, great-horned owl and long-eared owl). Although seldom seen in flight, due to their very nocturnal habits, they fly with a very buoyant pattern much like that of a short-eared owl.

Long-eared owls usually nest in old tree nests constructed by magpies, ravens, or other raptors. Steve Chindgren, a Utah falconer (pers. comm.), reports them to be in close association with Cooper's hawks (Accipiter cooperii), alternating nesting sites in dense groves of trees along a stream or river from year to year. They will on occasion nest on protected ledges or in a deep crack in rocks (Karalus and Eckert 1974).

White and Behle (1960) report two specimens, both in Wyoming. One had a nest with three young in a willow-wood tree. During this study one specimen was collected from the NRA. An injured long-eared owl was found on the Flaming Gorge Dam. The owl was taken to the Salt Lake City rehabilitation center where it died three days after being found. No apparent cause of death could be found.

Habitat available to the long-eared owl exists throughout both the NRA and Brown's Park. Thick vegetation is preferred and areas of this type in association with the Flaming Gorge reservoir, Green River, or small streams, such as Sears or Crouse Creeks likely harbor some nesting pairs.

Saw-whet owl (Aegolius acadicus)

This small owl, while not actually seen, was heard throughout the Dutch John area. Its rather melodious call could be heard nightly in the spring. The saw-whet owl while quite vociferous at night is a shy, silent forest dweller during the daylight hours. Although secretive, when located they will often allow close inspection without taking flight (Steve Chindgren, pers. comm.).

Saw-whet owls are slightly smaller than the screech owl having a length of seven inches and a wing span of 17 inches (Robbins, et. al. 1966). The head is round without ear tufts. A conspicuous facial mask is evident, which dips between the eyes forming a well defined "V".

Pygmy owl (Glaucidium gnoma)

The pygmy owl is the smallest owl of the area. It is bluebird sized with a round tuftless head. It has black markings or "eye spots" on the back of its neck. The tail is long and held at a jaunty angle (Robbins et. al. 1966). It has dark streaking on the breast which separates it from all other small tuftless owls of the area. It has two color phases, reddish and grey, the female more often being reddish (Karalus and Eckert 1974).

Hunting habits and prey preferences are somewhat different. Although small in size it is a very aggressive owl and will attack prey much larger than itself. It is reported to eat insects, bats, small rabbits, mice and birds. A full grown domestic hen weighing over six pounds was observed killed by the bold little owl, an item over 64 times its own weight (ibid).

The pygmy owl is to a large extent diurnal, hunting early morning and mid-afternoon to evening. It is not a silent flyer and can be heard flying off after flushing. It hunts by flying back and forth across meadows or grasslands adjacent to dense stands of trees. It will also hunt from perches, where it waits patiently for an opportunity.

The pygmy owl is a year round resident and possibly more abundant than previously thought. Two birds were found in and adjacent to the area. One pygmy

owl was observed below the dam on the Little Hole Trail flying off into ponderosa pines carrying a mouse in its beak (M. Sangster pers. comm.). A second bird was seen below Brown's Park in Lodore Canyon roosting in a juniper tree. It flew off after being closely approached.

Habitat frequented by the pygmy owl is found throughout the NRA and Brown's Park. It is found at elevation between 5,000 feet and 10,000 feet. Old woodpecker holes between eight and 24 feet in height are used as nest sites (Karalus and Eckert 1974). During mid-day it can be found perching in dense juniper-pinyon stands or other shaded areas of the forest. Clearings and meadows within or adjacent to forested areas are reported to be preferred. Areas along the Green River, Bear Top Mountain and Taylor Flat appear to meet this habitat criteria.

Burrowing owl (Speotyto cunicularia)

This owl is commonly seen standing erect on low dirt mounds or on low fence posts. It is a small, brown, long legged owl and can scarcely be confused with any of the other owl species.

Food of this small owl is thought to be mainly insects, although a considerable portion of their diet is made up of small rodents and lizards. Smith and Murphy (1973) found almost three percent of the pellets containing jackrabbit remains. They also found silphids and formicids concurrently with these remains leading them to suggest the jackrabbits may have been carrion from nearby road kills.

Burrowing owls were not found within the study area proper. However, a report of burrowing owls using marmot (*Marmota flaviventer*) holes in the Browne Lake area was received in October, 1976, (Verr Don Durfee pers. comm.). This area west of the NRA was not checked, but it will be further documented during the summer of 1977.

Typical burrowing owl habitats, desert, grassland, and prairie are found in both the NRA and Brown's Park. They are commonly found in association with other burrowing animals especially prairie dogs. While they can dig their own burrows they seldom do so preferring to use holes previously dug by other mammals.

Screech owl (Otus asio)

The screech owl is a small owl with distinct ear tufts either erected in agitation or laid flat when at ease. Screech owls display both a red and grey color

phase irrespective of sex. The facial disk is quite apparent. In flight it appears much like a miniature great-horned owl, short, stubby, no neck, short tail and broad wings.

Close habitation with humans is frequently encountered and the owls may often be found in cities and towns. Holes and hollows in old trees are frequently used for nesting and roosting. It will use old buildings and also is known to use magpie nests (Karalus and Eckert 1974). Old orchards are also reported to be heavily used (ibid). Within the NRA and Brown's Park there is much habitat that appears suitable for the screech owl.

This small owl was not seen during the survey, however, White and Behle (1960) found two specimens on the Wyoming portion of the NRA. Also a rancher reported what he thought to be a screech owl around his residence (Steve Radosevich pers. comm.) in Brown's Park.

Flammulated owl (Otus flammeolus)

A very small owl found in pine woods. It is the only small owl with dark eyes. The ear tufts are small and when held horizontal appear as small points on the sides of the crown. It has small but strong feet. The variegated plumage is inconspicuous in its natural habitat.

Flammulated owls were not located in the area, but little is known of this owl's range within the state. They are found along the Wasatch front in habitat similar to that found in Brown's Park and the NRA. They are reported to nest at high elevations, up to 10,000 feet (Karalus and Eckert 1974). Dense foliage along the trunk mid-way between ground and tips of pine trees is preferred for day time roosting. Nests are often located in flicker holes.

Diet is almost 90 percent insects and invertebrates. It will, however, take an occasional mouse and rarely a bird. Ants are reported by Karalus and Eckert (1974) to be a favored item.

The flammulated owl is migratory. White (Clayton White pers. comm.) reported mist netting flammulated owls during the night at a water hole in southern Utah. He believed they were migrating through at this time.

Short-eared owl (Asio flammeus)

Short-eared owls are medium sized, brownish owls found frequently around marshland or swale areas. Their ear tufts are seldom noticed as they are small and usually lying flat along the head, hence the name. The flight is quite buoyant with the wings lifted high over the body. This crow-sized owl is much more conspicuous than any other owl. This is due to its crepuscular hunting habits and occasional perching on fence posts and low poles in open areas during daylight hours.

The short-eared owl is found most often far removed from wood lot or forest. It nests on the ground in dried grasses, weeds or cattail stalks. It is also known to use mammal holes.

Although not seen or reported in the area, several places appear to be favorable habitat for this owl. Most notably of these are the high grasses around the reservoir in the Jug Hollow-Spring Creek area, some of the farmlands east of Manila with marsh ground interspersed with cultivated fields and pasture, and similar areas surrounding the ranches and refuge in Brown's Park.

Spotted owl (Strix occidentalis)

The spotted owl may be present in the area. It is a dark, medium-large owl with conspicuous white spots on the back, neck and head. The facial disk is large and accentuates the round head and dark eyes of this 'earless' owl.

The Mexican spotted owl (S. o. lucida) is found in southern Utah, but is also reported from the central Colorado mountains, habitat not unlike that found in Brown's Park and the NRA. These owls are reported to prefer forested canyons with groves of maple or aspen lining creek banks at their base (Karalus and Eckert 1974). Narrow canyons of mature, (climax condition) pine and cottonwood trees are a necessary component of their ecosystem.

Recent work in several western states indicates that spotted owls may be located using a prerecorded cassette tape of their calls. Calls from the territorial owls are elicited by use of the tape, thereby showing their presence in an area. The vocalizations of a spotted owl are quite distinct and usually are not confused with its other nocturnal cousins.

Snowy owl (Nyctea scandiaca)

The snowy owl is the largest owl found in North America. Its white feathers are lightly tipped with slate colored spots. No ear tufts are present on the large round head. It appears heavy bodied, however, the brilliant white plumage seems to soften this image and despite bulky looks the snow owl imparts a "streamline" appearance. This owl is not easily confused with any other owl.

Snowy owls make occasional sojourns into Utah during winter months. Sightings are recorded for the state along the Wasatch Front, Bear Lake, Cache Valley and as far south as Ephraim (Hayward, et. al. 1976). These records indicate they may infrequently be found in the NRA or Brown's Park. Hanson (1971) reported on snowy owl incursions into the Pacific Northwest. He suggested these result following high lemming population years due to greater owl nest success and production. He also mentioned the large conspicuous birds are quite unwary and often the victim of senseless killing.

CONCLUSION

The FGNRA and Brown's Park are areas rich in raptor numbers as well as specie diversity. A total of 27 raptor species are presently using or theorized to be using the area during at least one portion of the year. It is hoped this study has posed queries which a further all encompassing study may resolve.

Raptors are situated on or near the top of various food chains. Consequently they are in the dubious position of monitoring possibly destructive changes in the environment. They are also very susceptible to obvious physical changes such as range modifications, and camp or habitation developments in nesting or hunting territories.

Range improvement practices including burning, chaining or spraying may have either deleterious or beneficial effects. This depends how and when they are conducted. Large scale modifications with little or no regard for wildlife in general may restrict raptors presence in an area. However, range manipulations can be designed to enhance an area for raptor use. Enhanced areas present a variability in habitat and avoid monocultures. In such an area attention is given to maintaining a major portion in edge and subclimax conditions. When such a project is undertaken is important, but to a lesser extent. If conducted during nesting periods reduced production may well result. However, if deferred till young birds are on wing or prior to resident specie nesting activities the project may be conducted with negligible results.

Cliff sites which are often propitious raptor nest habitat may be jeopardized with development of campsites, trails, public facilities or homesites. Most cliffs of the area are difficult to improve as they have adequate perchs and nest ledges scattered throughout their length and width. Some areas may be protected from further transgressions by erection of restricted zones, these are directed mainly toward boaters in a few limited areas.

Raptors offer recreational opportunities to the photographer, bird watcher, or naturalist simply by their presence or suspected occurrence. At the present time it may be in the best interest of the falconiforms for managing agencies to take a passive role in informing the general public of the area's uniqueness due its raptor specie diversity. Whether the public's ethical behavior at this time warrents dis-

closure of nesting birds of prey is open to question as numerous raptors are continually shot each year. Therefore, although some of the nesting situations lend themselves to excellent opportunities for photography and observation they cannot be developed for this purpose at this time. It only takes one destructive individual to completely eliminate a nesting attempt, site, or a productive pair. Perhaps in the future if the public proves competent, unobtrusive observation points can enhance the visitors knowledge and experience by pointing out these wonders of nature.

The following is adapted from Behle and Perry's (1975) "Utah Birds," check-list.

Status Code

P - permanent resident, found year long, nests in area. Example: Golden eagle. Also includes some species which will remain during mild winter weather or move when necessary to avoid harsh conditions. Example: Red-tailed hawk.

S - summer resident, those that nest in the area and migrate elsewhere. Example: Osprey.

W - winter visitor, moves into area in late fall, spends the winter and leaves by early spring, does not nest in area. Example: N. Bald eagle.

T - transient, includes those species passing through during fall and spring migrations but not known to winter or summer in area. Example: Merlin.

Abundance

C - common, any raptor that is observed 20 or more times in a 10 day period on the average and for a given day, in season, and in habitat it would be expected to find three or more individuals of the specie on the average. Example: American kestrel.

U - uncommon, for those kinds which during a 10 day period one would expect to find five individuals on the average and for a given two day period in season, and in habitat it would be expected to find at least one individual of the specie on the average. Example: Goshawk.

R - rare, used if the species has been observed only two times in the past 10 years, or less than 10 times per year or one would not expect to find. Example: Peregrine falcon.

H - hypothetical, used if the species occurrence or lack thereof is open to question, where favorable habitat exists, some reported in similar habitat, but unverified by an actual sighting. Example: Spotted owl.

Raptors found in the Flaming Gorge National Recreation Area

| <u>Species</u> | <u>Abundance</u> | <u>Seasonal Status</u> |
|----------------------------|------------------|------------------------|
| Turkey vulture | C | S |
| Goshawk | U | P |
| Sharp-shinned hawk | R | S |
| Cooper's hawk | U | S |
| Red-tailed hawk | C | P |
| Swainson's hawk | H | S |
| Ferruginous hawk | R | P |
| American rough-legged hawk | C | W |
| Golden eagle | C | P |
| Bald eagle | C | W |
| Marsh hawk | U | P |
| Osprey | C | S |
| Prairie falcon | U | P |
| Peregrine falcon | R | P |
| Merlin (Pigeon hawk) | R | T |
| American kestrel | C | P |
| Gryfalcon | H | W |
| Screech owl | R | P |
| Flammulated owl | H | S |
| Great-horned owl | C | P |
| Pygmy owl | U | P |
| Burrowing owl | R | S |
| Spotted owl | H | P |
| Long-eared owl | U | P |
| Short-eared owl | H | P |
| Saw-whet owl | C | P |
| Snowy owl | H | W |

Raptors Found in Brown's Park

| <u>Species</u> | <u>Abundance</u> | <u>Seasonal Status</u> |
|----------------------------|------------------|------------------------|
| Turkey vulture | U | S |
| Goshawk | U | P |
| Sharp-shinned hawk | R | S |
| Cooper's hawk | U | S |
| Red-tailed hawk | R | P |
| Swainson's hawk | R | S |
| Ferruginous hawk | H | P |
| American rough-legged hawk | C | W |
| Golden eagle | C | P |
| Bald eagle | C | W |
| Marsh hawk | C | P |
| Osprey | H | S |
| Prairie falcon | R | P |
| Peregrine falcon | R | P |
| Merlin (Pigeon hawk) | R | T |
| American kestrel | C | P |
| Gyr Falcon | H | W |
| Screech owl | R | P |
| Flammulated owl | H | S |
| Great-horned owl | C | P |
| Pygmy owl | R | P |
| Burrowing owl | H | S |
| Spotted owl | H | P |
| Long-eared owl | U | P |
| Short-eared owl | H | P |
| Saw-whet owl | R | P |
| Snowy owl | H | W |

NESTING RAPTORS

| <u>Flaming Gorge National Recreation Area</u> | | | <u>Brown's Park</u> | | |
|---------------------------------------------------|------------------------|----------------------------------------------|---------------------|------------------------|-----------------------------------|
| Species | # occupied areas | Strata | Species | # occupied areas | Strata |
| Turkey vulture | 5 | Caves, cracks | Turkey vulture | --- | ----- |
| Goshawk | 1 | Tree-stick nest | Goshawk | 2 | Tree - stick nest |
| Red-tailed hawk | 4 | Ledges stick nest | Red-tailed hawk | --- | ----- |
| Golden eagle | 9 | Cliff ledges stick nest | Golden eagle | 3 | Cliff ledges |
| Osprey | 6 | Rock pinnacles | Osprey | --- | ----- |
| Marsh hawk | 1 | On ground nest | Marsh hawk | 3 | On ground, swales and marshes |
| Prairie falcon | 2 | High cliff ledges | Prairie falcon | --- | ----- |
| American kestrel | 3 | Small pot holes in cliffs | American kestrel | 2 | Holes in trees and pinyon-juniper |
| Great-horned owl | 9* | Cliff ledges and cracks | Great-horned owl | --- | ----- |
| Burrowing owl | 1 | Ground and marmot holes | Burrowing owl | --- | ----- |
| Saw-whet owl | 4 | Ponderosa pine Pinyon-juniper holes in trees | Saw-whet owl | --- | ----- |

* In Wyoming cliffs immediately adjacent to Flaming Gorge Reservoir.

Nesting habitats for raptor species of NRA and Brown's Park

CLIFF AREAS

Turkey vulture
Golden eagle
Red-tailed hawk
Ferruginous hawk
Osprey
Prairie falcon
Peregrine falcon
American kestrel
Great-horned owl

TREES (adjacent to open areas)

Golden eagle
Red-tailed hawk
Swainson's hawk
Ferruginous hawk
American kestrel
Great-horned owl
Pygmy owl

DENSE FORESTED AREAS

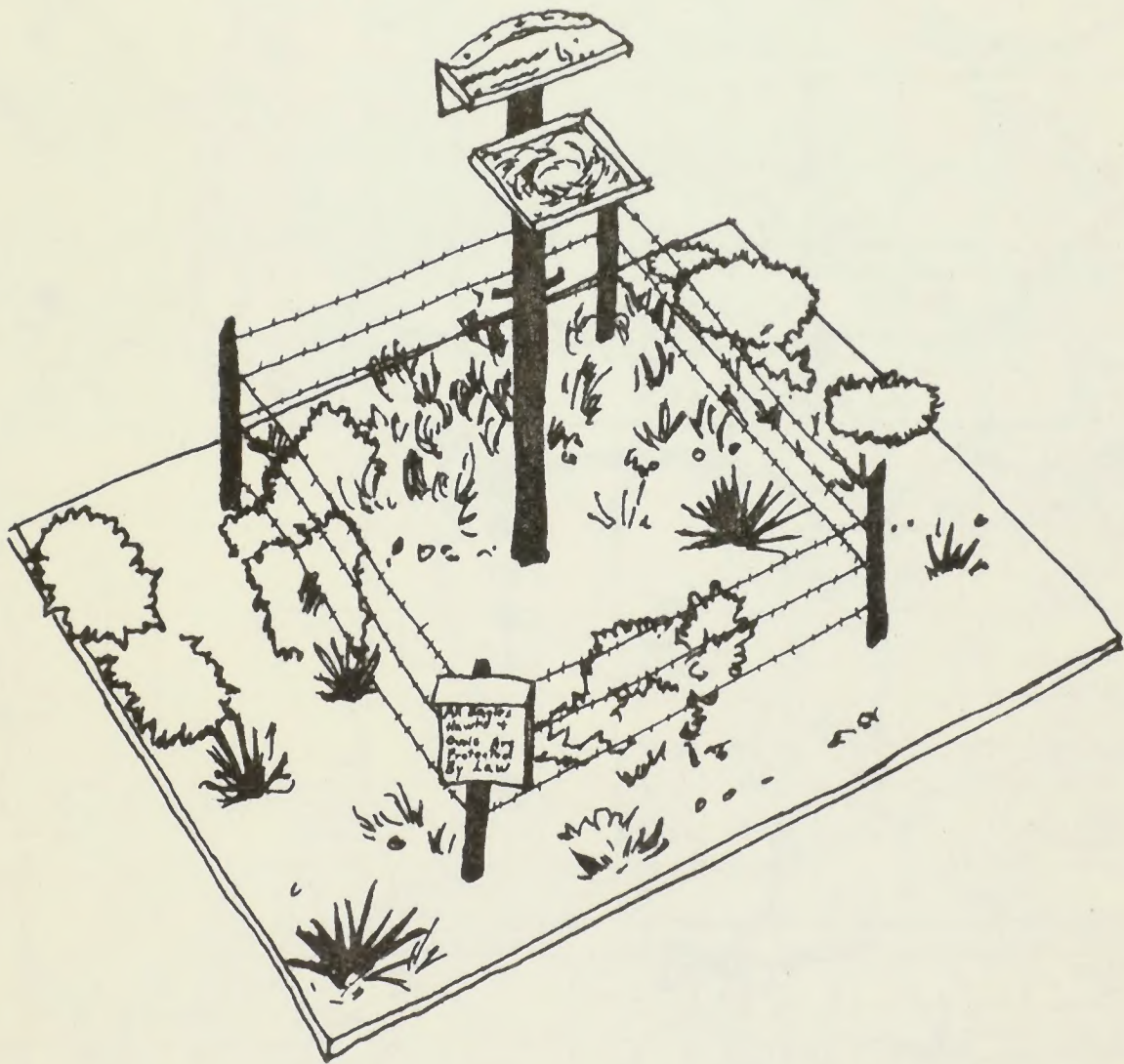
Goshawk
Cooper's hawk
Sharp-shinned hawk
Osprey
American kestrel
Screech owl
Flammulated owl
Great-horned owl
Pygmy owl
Spotted owl
Long-eared owl
Saw-whet owl

| | Marsh-grasslands | Cultivated fields | Bluffs and cliffs | Pinyon-juniper | Montane riparian woodlands | Ponderosa pine | Spruce-Fir | Aspen woodlands | Subalpine grasslands |
|--------------------|------------------|-------------------|-------------------|----------------|----------------------------|----------------|------------|-----------------|----------------------|
| Turkey vulture | | | <u>X</u> | | | | | | |
| Goshawk | | | | | — | X | X | X | |
| Sharp-shinned hawk | | | | | — | | — | | |
| Cooper's hawk | | | | X | | | X | — | |
| Red-tailed hawk | | — | X | X | — | | | | |
| Swainson's hawk | | — | | | | | | | |
| Ferruginous hawk | | | — | — | | | | | |
| Golden eagle | | | <u>X</u> | | — | | | | |
| Marsh hawk | X | X | | | | | | | |
| Osprey | | | <u>X</u> | | | — | — | | |
| Prairie falcon | | | <u>X</u> | | | | | | |
| Peregrine falcon | | | — | | | | | | |
| American kestrel | | — | X | X | — | | | | |
| Screech owl | | — | | | | | | | |
| Flammulated owl | | | | | — | — | | | |
| Great-horned owl | | | <u>X</u> | | — | — | — | | |
| Pygmy owl | | | | X | — | — | | | |
| Burrowing owl | | — | | | | | | | <u>X</u> |
| Spotted owl | | | | | | | — | | |
| Long-eared owl | | | | | — | — | — | | |
| Short-eared owl | | — | | | | | | | |
| Saw-whet owl | | | | X | X | X | — | | |

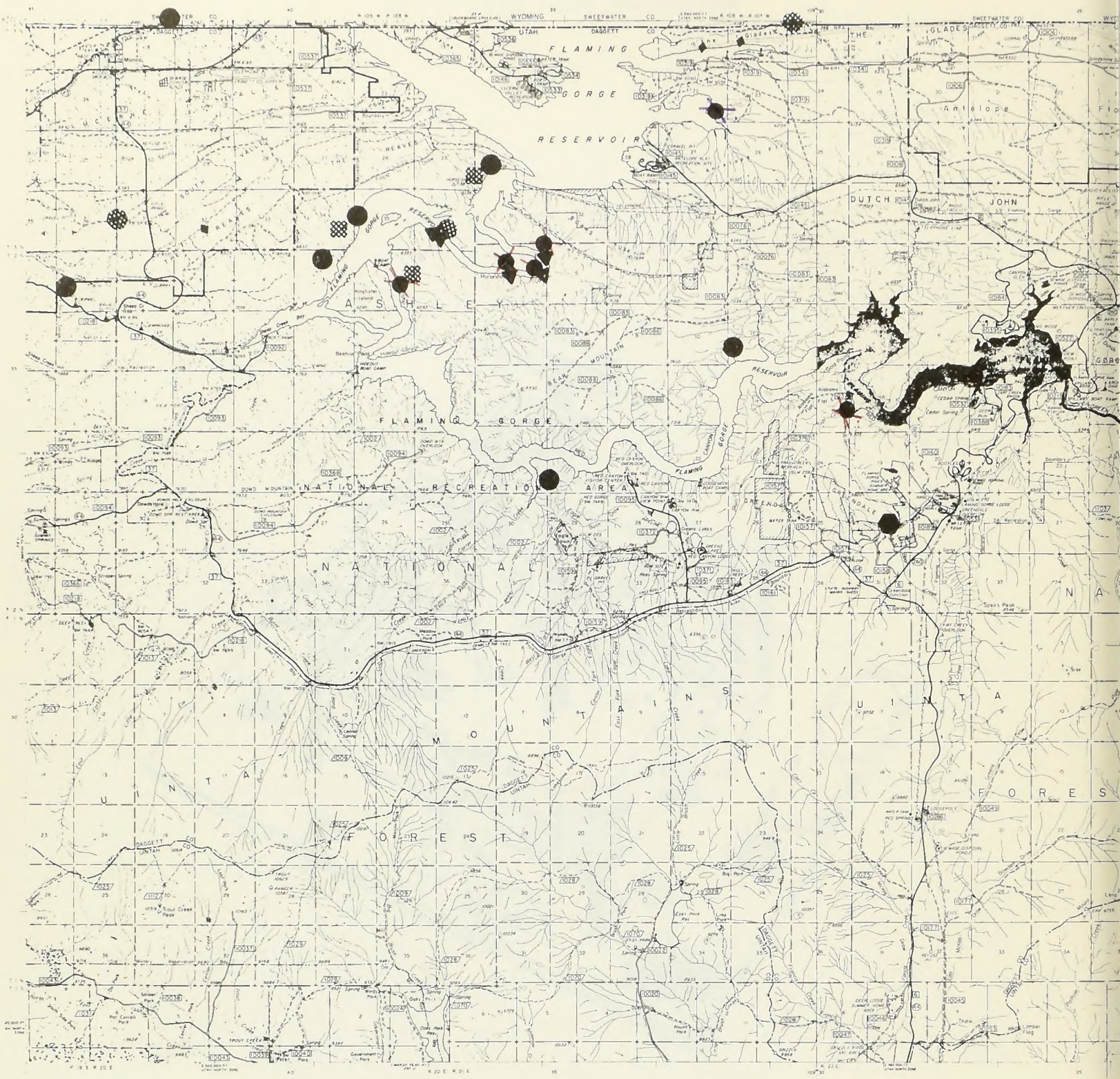
— nesting habitat utilized in Utah and available in Brown's Park and NRA.

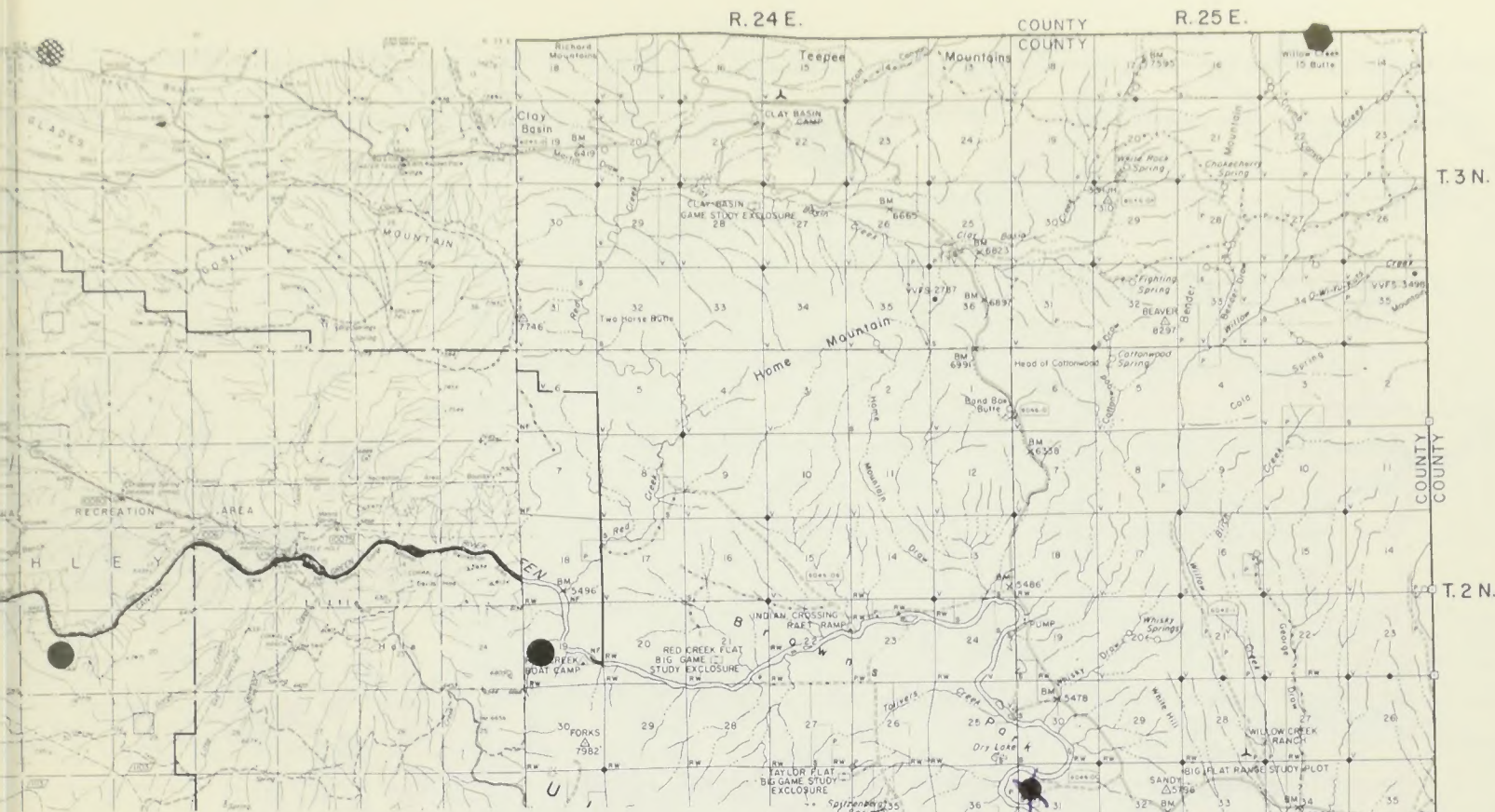
X nest strata observed utilized in Brown's Park and NRA.

ARTIFICIAL NEST STRUCTURE











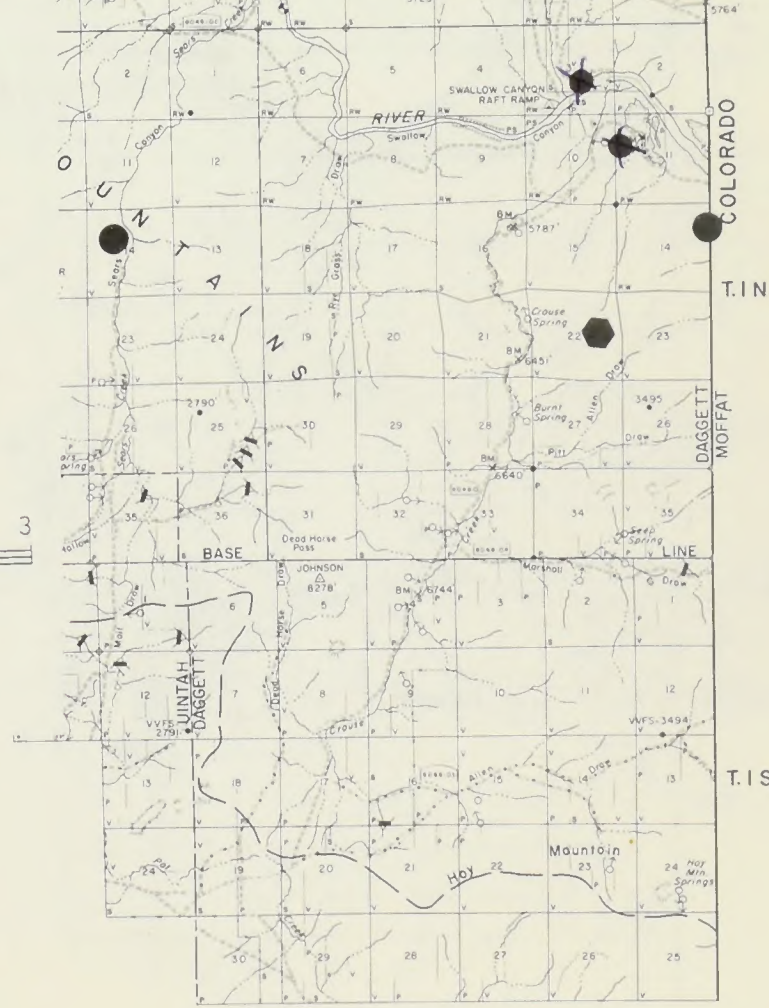
Artificial nest structure for Buteonid Hawks. Overall height would be about 16 feet (4.9 m). The fence is to prevent cattle from killing newly planted trees (not shown). Structure could be modified to attract Kestrels and small owls by substituting a nest box in place of platform. (Olendorff and Stoddart 1974)

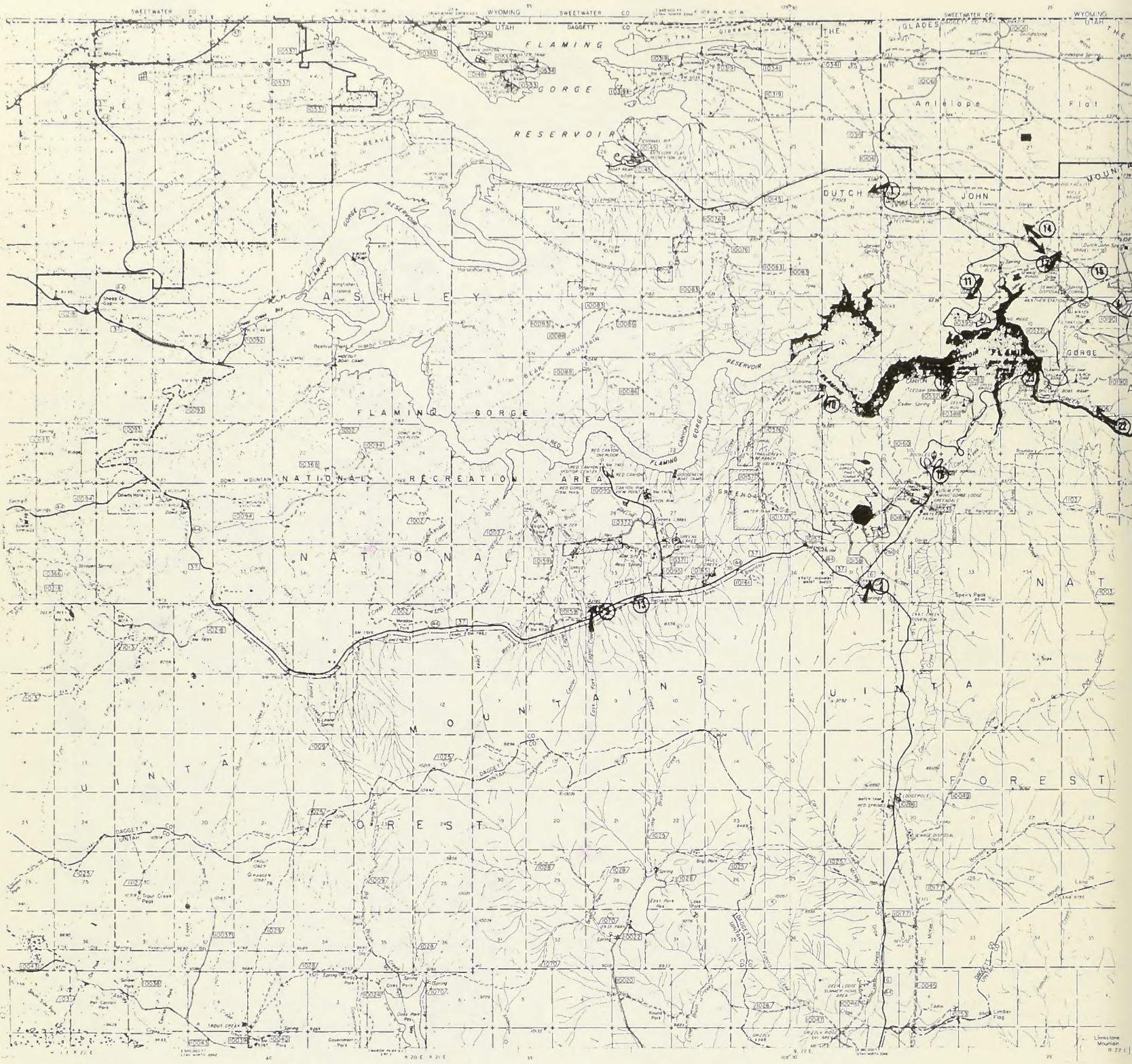




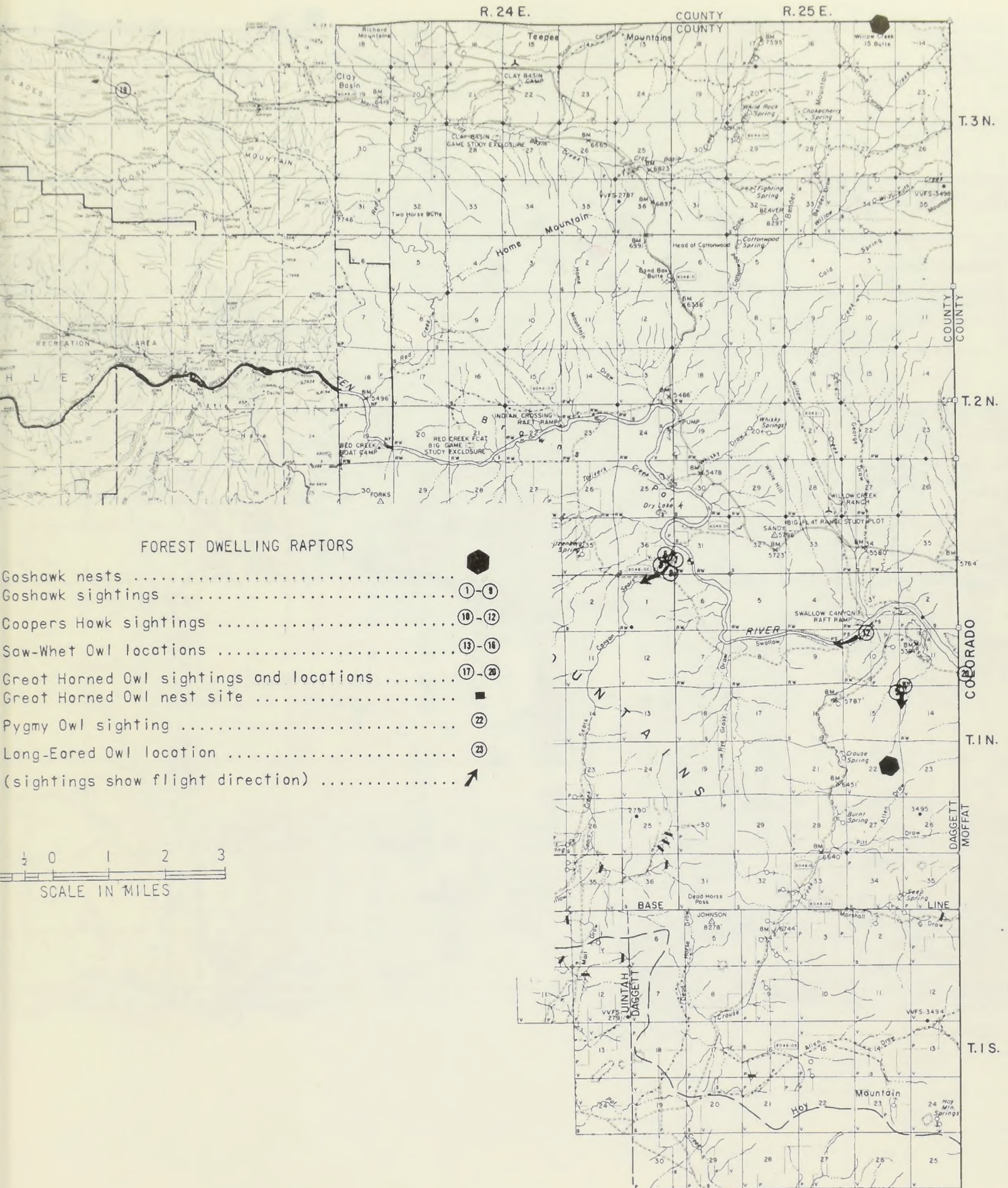
ACTIVE EYRICE (76) COMPOSITE

- Turkey Vulture 
- Golden Eagle 
- Redtailed Hawk 
- Goshawk 
- Prairie Falcon 
- Kestrel 
- Osprey 
- Harrier 












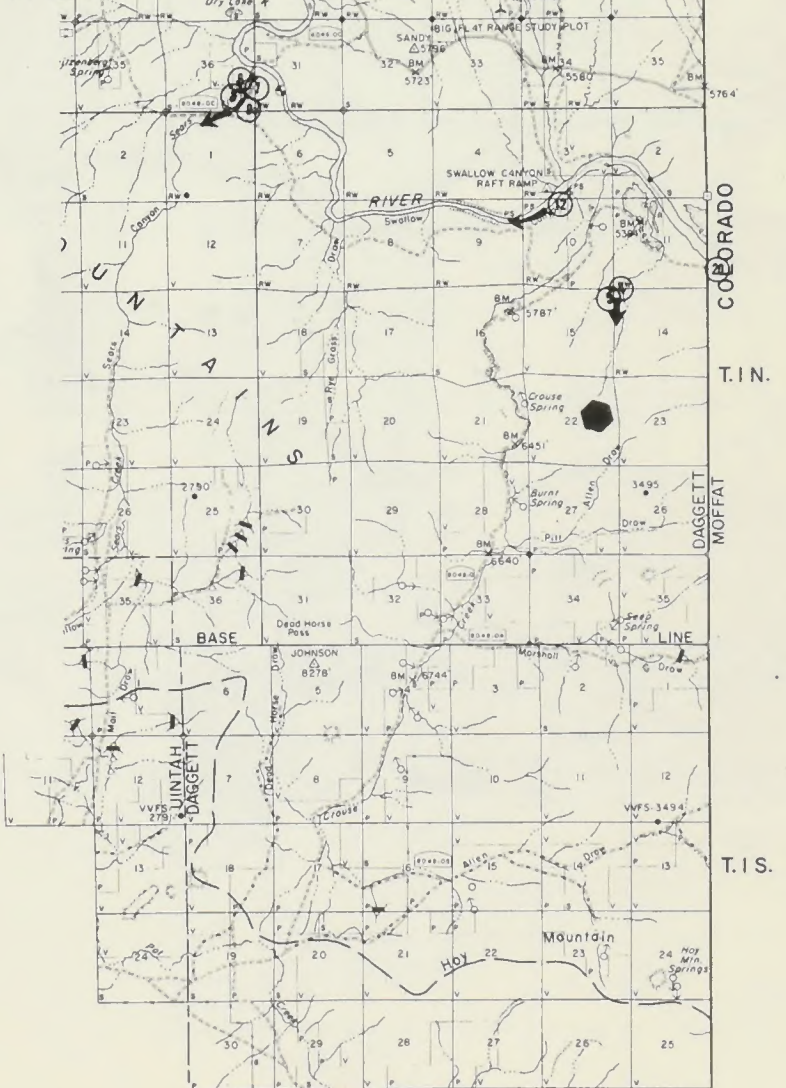
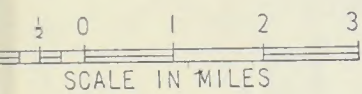


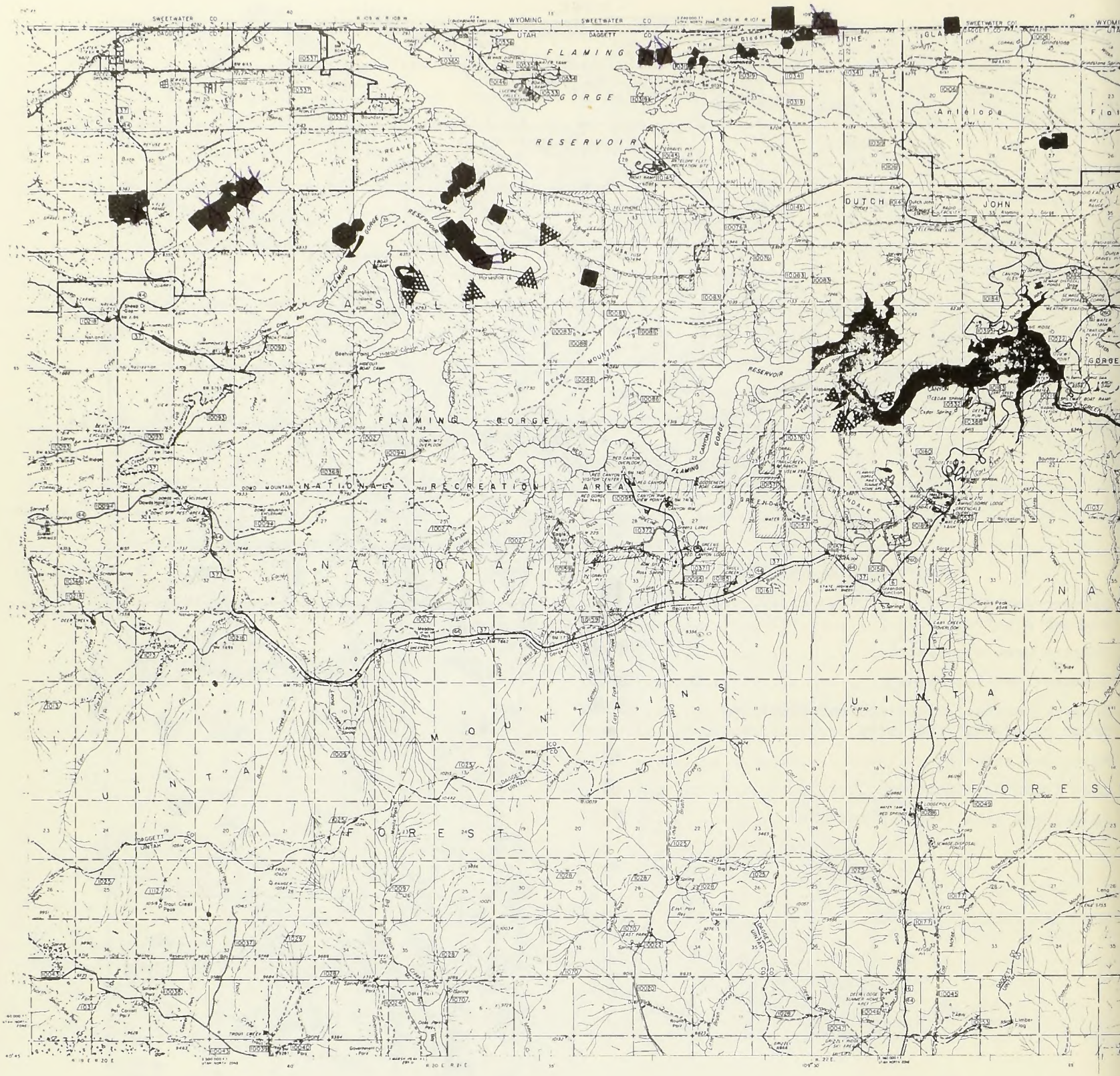
Limey tone
Mountains
© 22 C

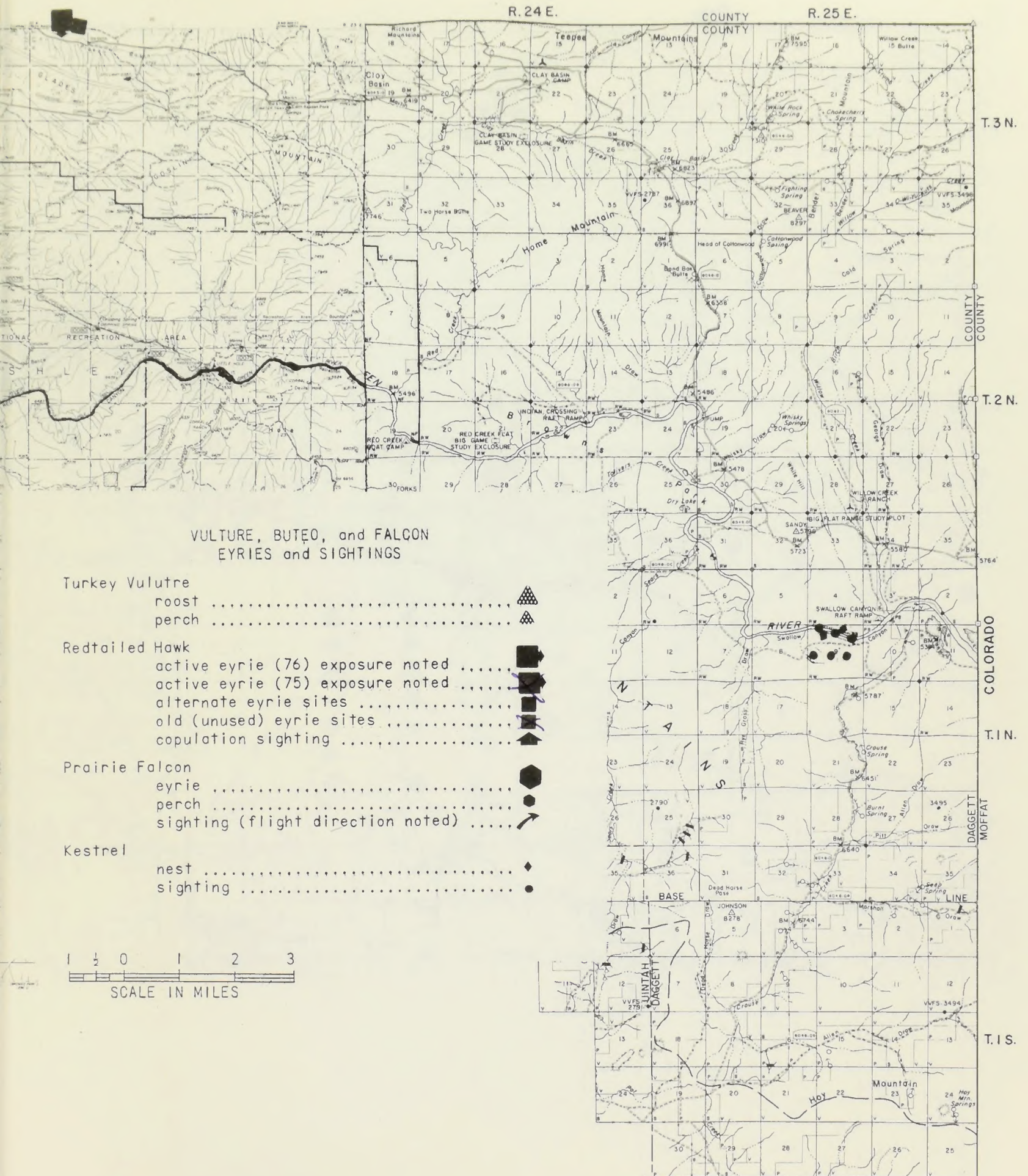


FOREST DWELLING RAPTORS













- Goshawk nests 
- Goshawk sightings 
- Coopers Hawk sightings 
- Saw-Whet Owl locations 
- Great Horned Owl sightings and locations 
- Great Horned Owl nest site 
- Pygmy Owl sighting 
- Long-Eared Owl location 
- (sightings show flight direction) 

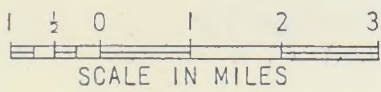


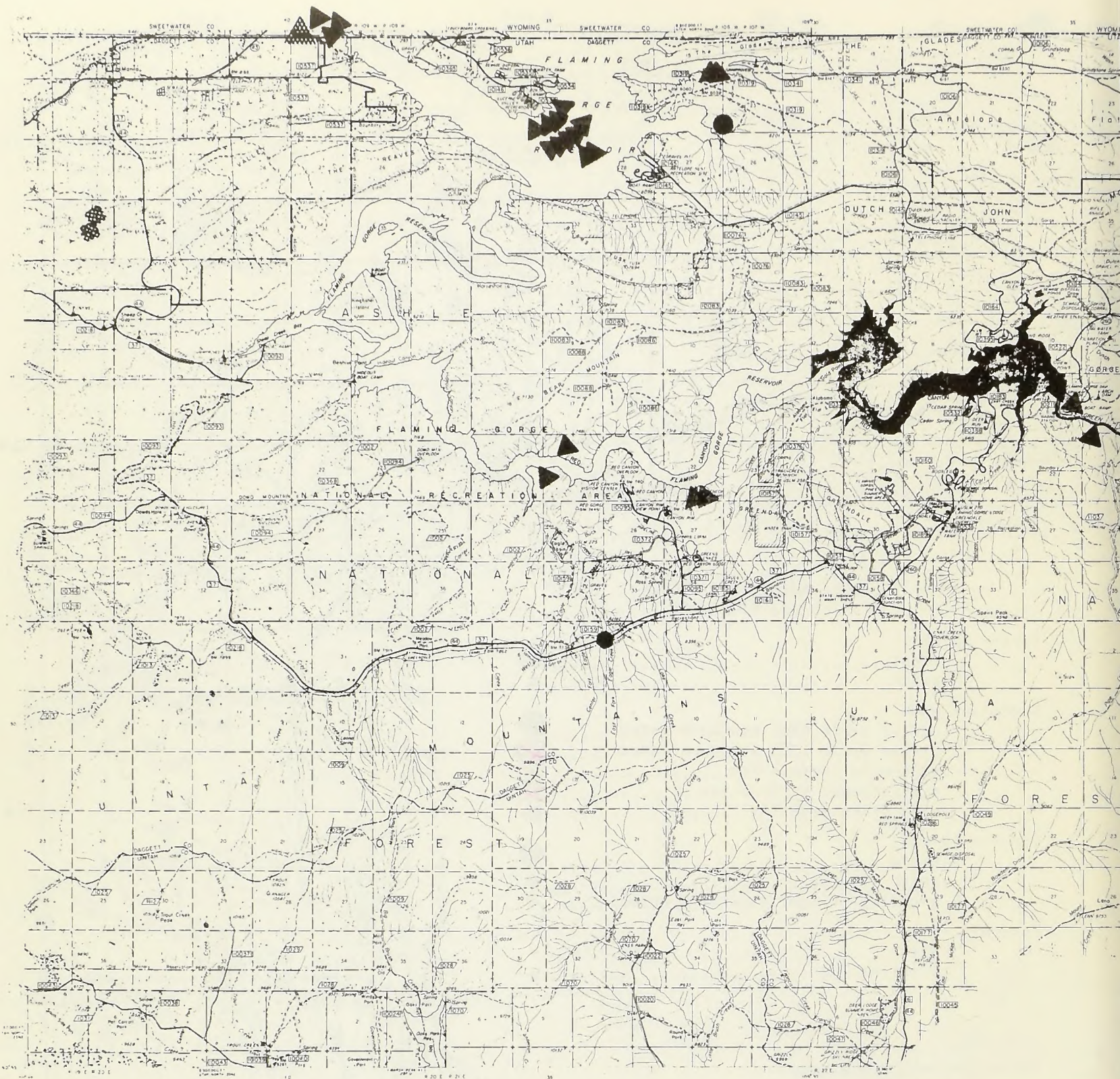


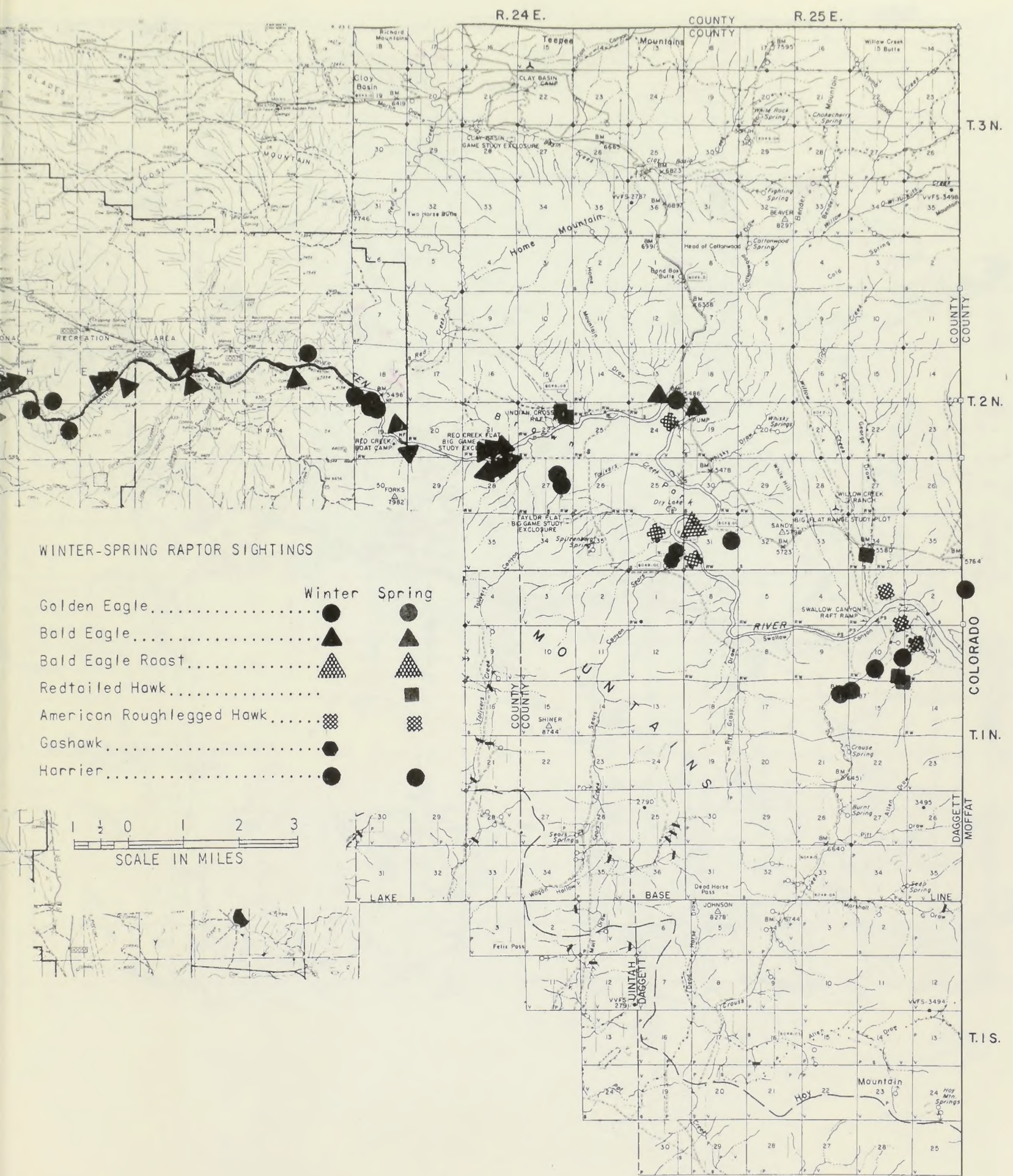


VULTURE, BUTEO, and FALCON
EYRIES and SIGHTINGS

- Turkey Vulture
 - roost 
 - perch 
- Redtailed Hawk
 - active eyrie (76) exposure noted 
 - active eyrie (75) exposure noted 
 - alternate eyrie sites 
 - old (unused) eyrie sites 
 - copulation sighting 
- Prairie Falcon
 - eyrie 
 - perch 
 - sighting (flight direction noted) 
- Kestrel
 - nest 
 - sighting 



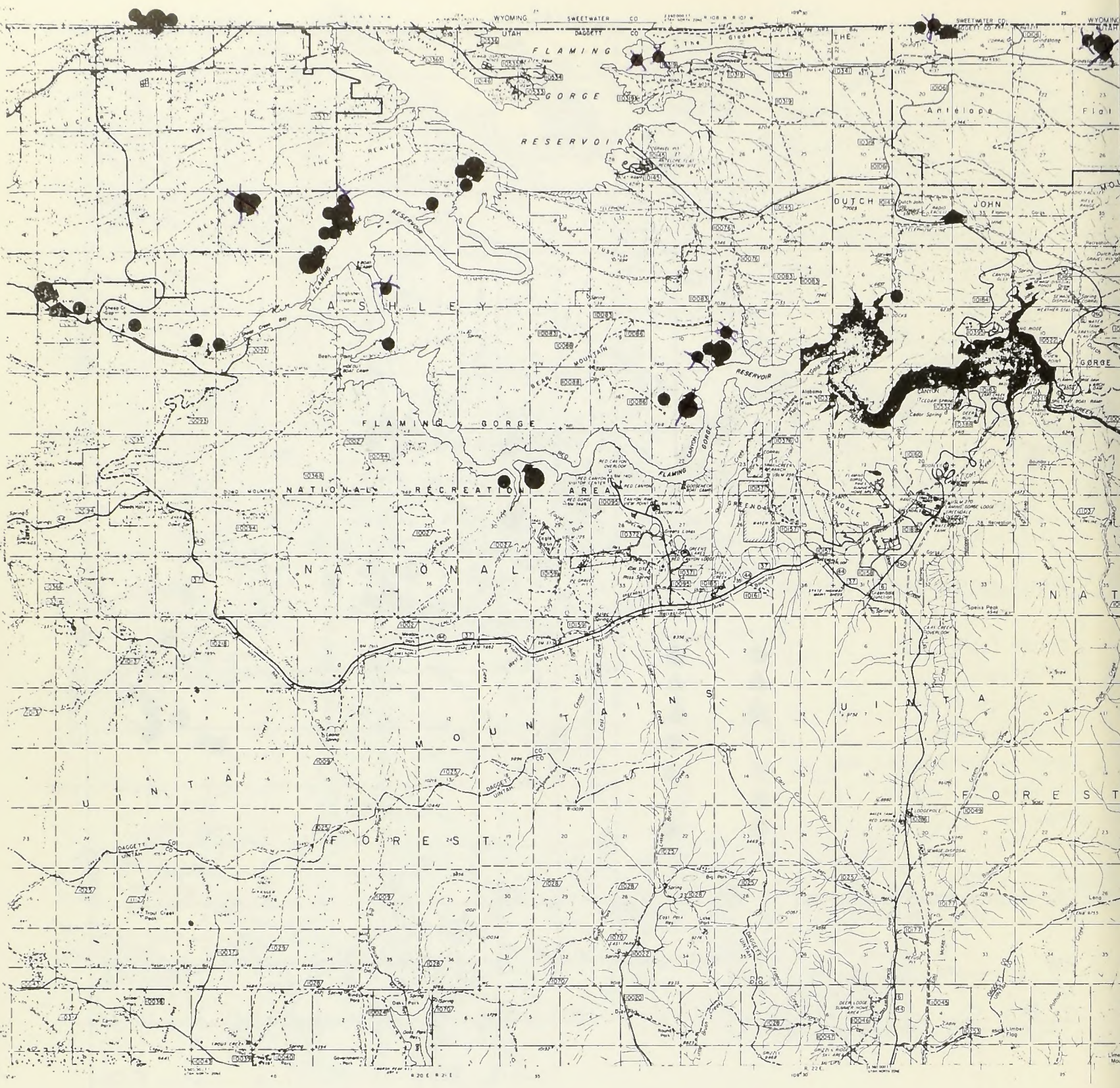




WINTER-SPRING RAPTOR SIGHTINGS

- | | Winter | Spring |
|--------------------------------|-------------------|-------------------|
| Golden Eagle..... | ● | ● |
| Bald Eagle..... | ▲ | ▲ |
| Bald Eagle Roost..... | ▲ (hatched) | ▲ (hatched) |
| Redtailed Hawk..... | ■ (hatched) | ■ (hatched) |
| American Roughlegged Hawk..... | ■ (cross-hatched) | ■ (cross-hatched) |
| Gashawk..... | ● (with dot) | ● (with dot) |
| Harrier..... | ● (with dot) | ● (with dot) |

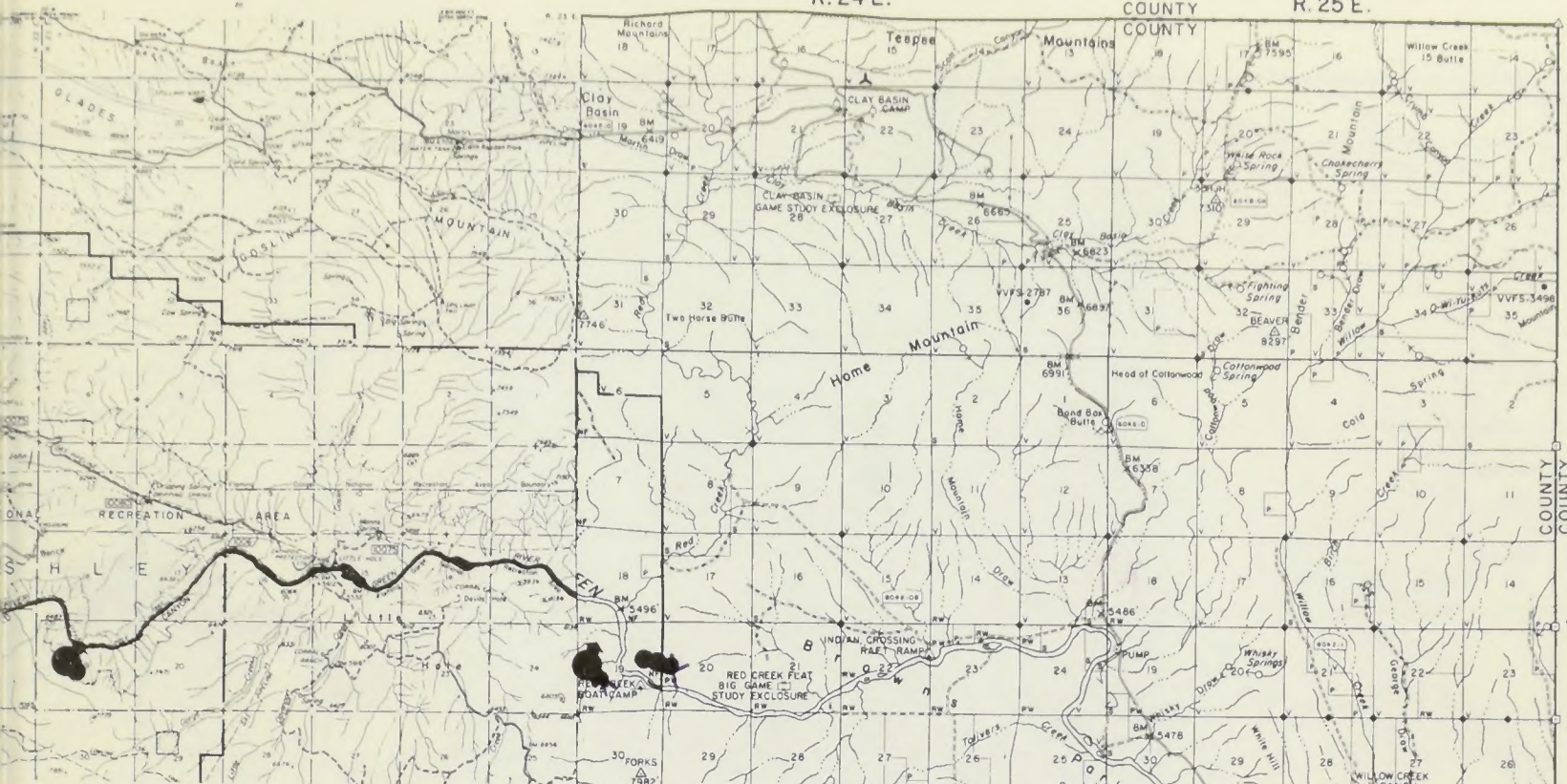




R. 24 E.

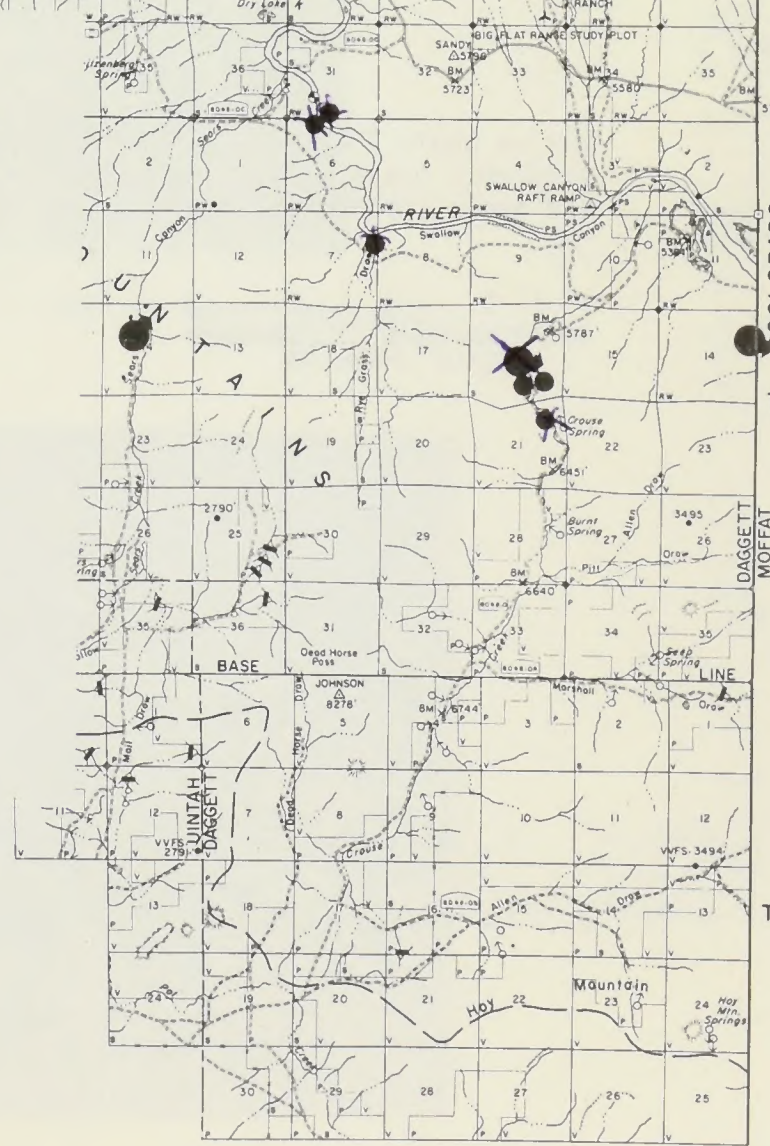
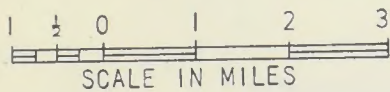
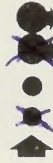
COUNTY COUNTY

R. 25 E.



GOLDEN EAGLE

- active eyrie (76)
- active eyrie (75)
- alternate eyries
- old (unused) eyries
- copulation sighting



T. 3 N.

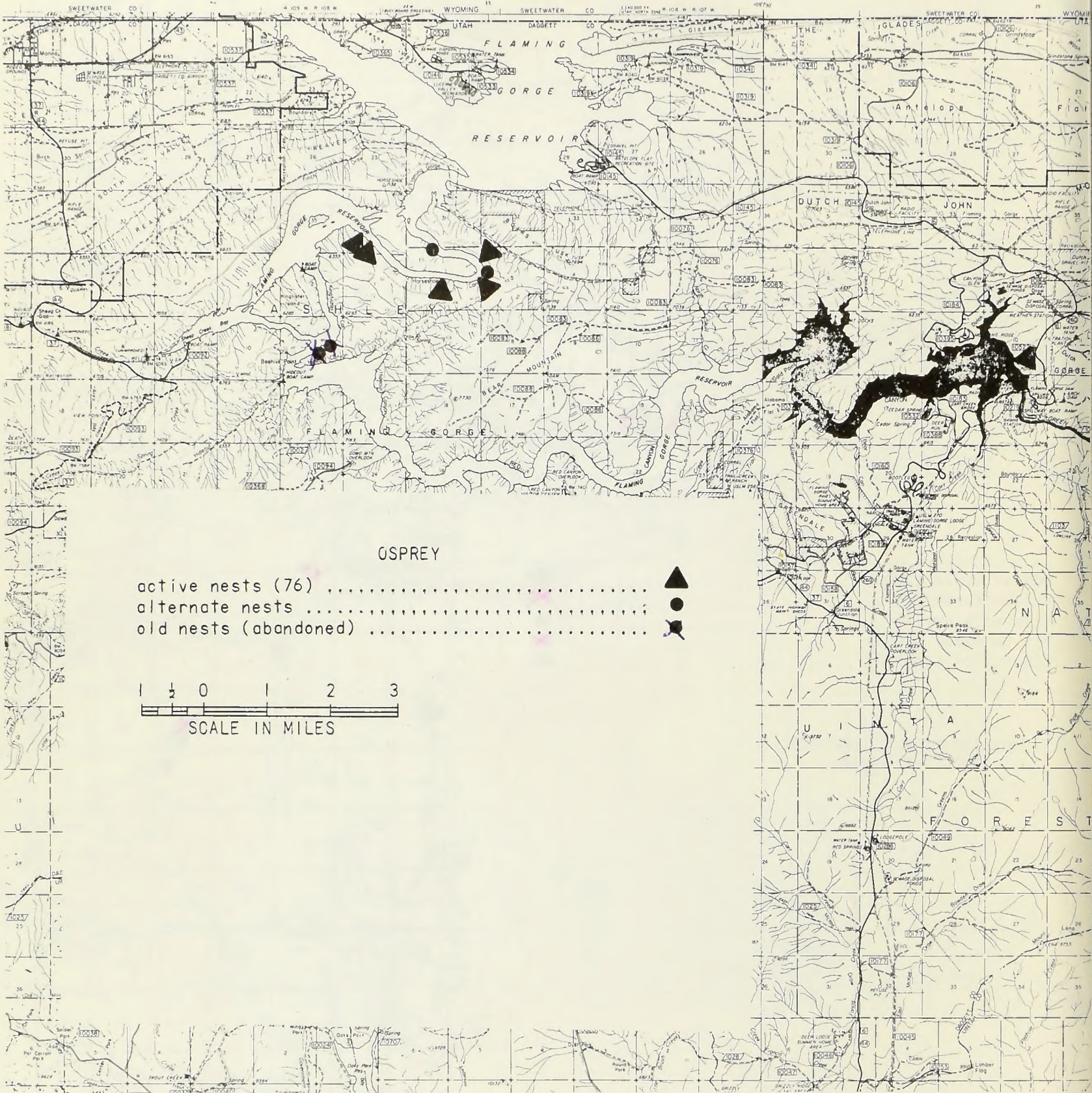
T. 2 N.

COLORADO

T. 1 N.

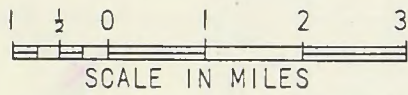
DAGGETT MOFFAT

T. 1 S.



OSPREY

- active nests (76) ▲
- alternate nests ●
- old nests (abandoned) ◼



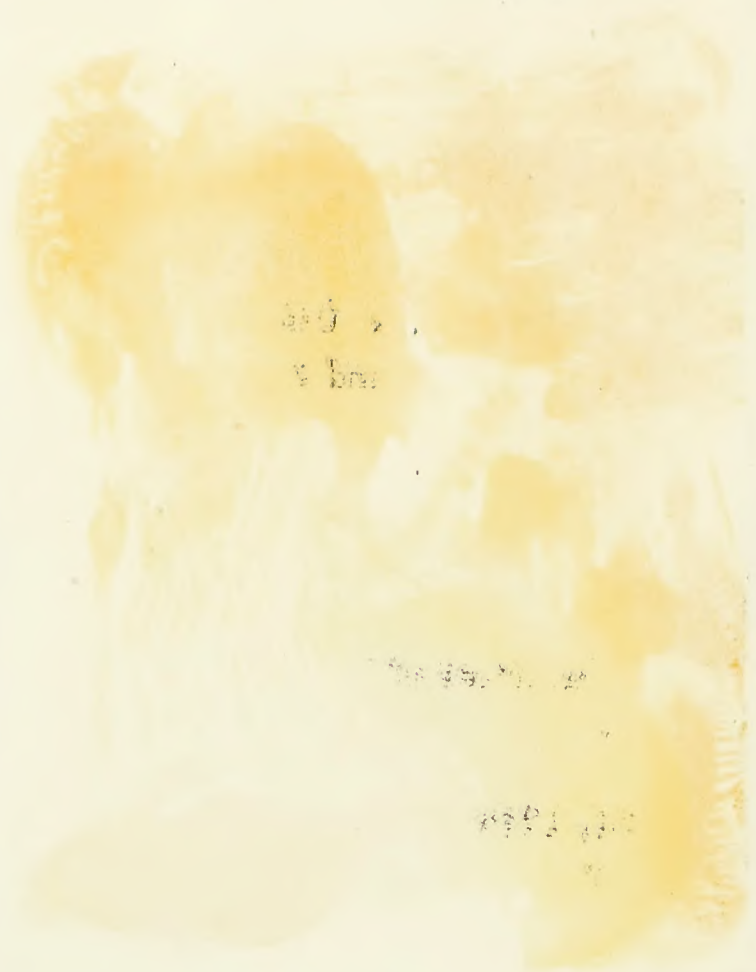
MULE DEER POSSIBLY KILLED BY EAGLE



Torn skin ripped from center of back to lower shoulder.



Deep puncture at base of neck above spine.



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