

WINTER POPULATIONS, BEHAVIOR, AND SEASONAL DISPERSAL OF BALD EAGLES IN NORTHWESTERN ILLINOIS

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As a result of efforts by Bent (1937), Broley (1952), Herrick (1924, 1932, and 1933), Imler (1955), and others, numerous data on the Bald Eagle (*Haliaeetus leucocephalus*) are available. Little of the published information, however, pertains to the winter habits of the species or to winter population dynamics and seasonal movements.

Between 27 November 1961 and 1 April 1962, at the Savanna Army Depot, Carroll and Jo Daviess counties, Illinois, my assistants and I spent 232 hours observing and attempting to trap eagles. Additional time was devoted to other aspects of the project (making and setting traps, securing bait, etc.). On several occasions we spent the entire daylight period in the area.

The study area extended for 14 miles along the Mississippi River and its backwaters and sloughs, which were proliferated with islands (Fig. 1). Most of the slightly rolling terrain bordering the river was covered by deciduous forest. The trees along a portion of the main channel had been thinned to the point that the area (between points 1 and 2, Fig. 1) resembled a park. The study area represented only a small part of the habitat suitable for eagles near Savanna; however, it probably had the greatest abundance of food and, therefore, eagles (we observed only four outside the Depot; three of these during spring dispersal). The concentrations reported during our study were larger than those reported elsewhere in the state.

My objectives were to record behavior, live-trap, color-mark, and determine the movements of Bald Eagles during the winter and early spring. As much additional information (e.g., weight, measurements, plumage, fecal and blood samples) as possible was also obtained prior to a bird's release.

Data presented in this paper are intended as a preliminary report. I hope bird-banders along the Mississippi Valley and in other areas having winter eagle concentrations will develop an interest in a similar project. A coordinated program could contribute significant data regarding seasonal movements of eagles and accordingly their conservation.

The study was supported by a grant from the Frank M. Chapman Memorial Fund. Northern Illinois University provided a research vehicle. Field assistance was given by James Tate, Jr., and Alfred Bjelland. Major Ira Meyers arranged for us to conduct our study on the United States Army Savanna Depot. Fish and Wildlife Service personnel, particularly Herbert Troester, aided the project by offering many valuable suggestions and by loaning equipment. Alexander Sprunt IV, of the National Audubon Society, assisted by placing articles in local newspapers to acquaint the public with the project and to request that color-marked birds be reported to the Society. Several commercial fishermen, including Richard Brown, aided us in various ways. Weather records were ob-

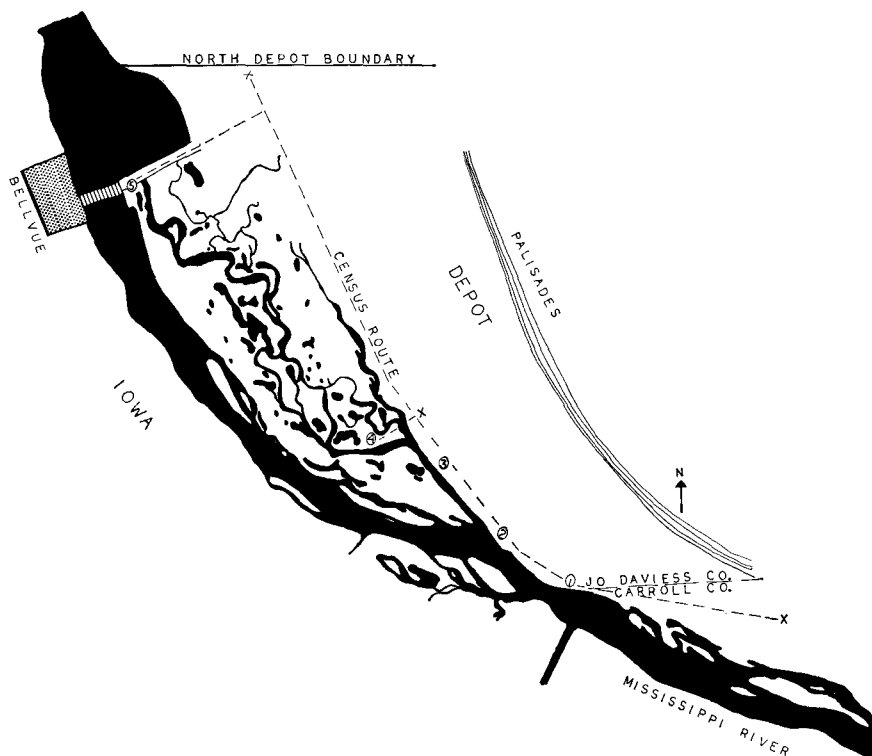


FIG. 1. Map of the study area. Plots marked 1, 2, 3, and 4 are four major feeding areas (see text). Area 5 is Lock and Dam 12.

tained from Raymond DePauw, Lockmaster at Lock and Dam 12. The success of this project was directly associated with the efforts of these individuals and organizations.

POPULATIONS AND FLUCTUATIONS

In recent years the populations of Bald Eagles wintering in the Central United States attracted the attention of ornithologists. Musselman (1949) was one of the first to publish comments regarding eagles wintering along the Mississippi River between Illinois and Iowa. The birds originally fed on offal from a packing plant, but later the abundance of fish at the new Keokuk dam attracted them. In the winter of 1947 and 1948, Musselman reported a total of 83 eagles, which was greater than concentrations previously observed in the area. He noted that the birds congregated along the river about 15 December and departed about 15 February.

More recent publications of Imler (1955), Robbins (1960), and Fawks (1961) indicated further the importance of the Mississippi Valley as a winter-

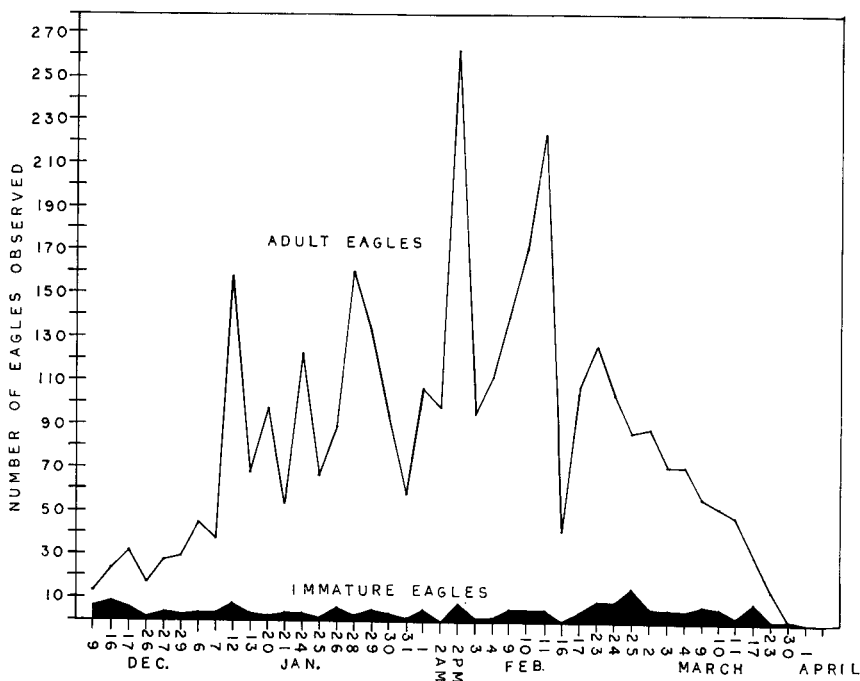


FIG. 2. Population fluctuations of adult and immature Bald Eagles as indicated by 41 counts during the winter of 1961-1962.

ing area for Bald Eagles. Data presented by Fawks (1961:56-57), however, are misleading, since the figures for some regions apparently include all birds observed during a period of several weeks or months.

Robbins (1960:4) analyzed the Bald Eagle records published in the Christmas Bird Counts sponsored by the National Audubon Society and noted a trend toward higher counts in the Mississippi Valley during the past 15 years. The counts, however, showed marked variation from year to year because of unequal coverage. He suggested the pools below dams caused eagles to concentrate near such localities.

My study indicated that daily variations in the eagle population were to be expected and that pools immediately below dams were of little importance in concentrating the birds. A single count by observers on the ground during any one day was an unsatisfactory indication of the eagle population for an extensive area. Observations over periods of several days were perhaps more indicative (Fig. 2). Censusing by airplane, as has been done by the Fish and Wildlife Service, appears to be a suitable method. Eagles were counted during the 1961 winter waterfowl survey and the number reported during mid-Febru-

TABLE 1
MAJOR WINTER AND SPRING CHANGES IN ICE CONDITIONS ON THE MISSISSIPPI RIVER,
SAVANNA ARMY DEPOT, 1961-1962

Date	Ice conditions within study area
9 December	First ice formed on sloughs
16 December	Backwaters and much of main channel frozen
26 December	Few open holes remain in main channel and sloughs
*29 December	Only four open holes (see text) remain open
10 March	Many open holes in main channel and sloughs
23 March	Main channel open; sloughs partially open
30 March	No ice; high water; sloughs flooding

* Periods of above-freezing temperatures caused these holes to enlarge.

ary at the Upper Mississippi Refuge was comparable to our high count (262) for a portion of the refuge (Savanna Depot) on 2 February.

Several guards at the Depot, employed there since the early 1940's, recalled that there were few, if any, Bald Eagles wintering on the Depot prior to 1942. This statement was substantiated somewhat by the trend indicated by Robbins (loc. cit.). Construction of Lock and Dam 12 (Fig. 1) was the only change recorded in recent years that might have affected eagle populations near Savanna. Provided the dam was responsible for maintaining the extensive sloughs, and thereby indirectly responsible for the open areas used by eagles when feeding, its influence was definite; otherwise it seemed of little importance. Once during the study we observed an eagle feeding at the open water below the dam and on several occasions one or two birds were observed in trees near the dam. Fish were not readily available near the dam.

Although eagles perched elsewhere (e.g., occasionally within the dense forest during early December), the concentrations always occurred near areas of open water on the frozen main channel or sloughs. Most sloughs appeared heavily populated by fish and this prey seemed more readily available to eagles feeding in these areas than to those feeding along the swifter main channel of the river. Certain groups of large dispersed trees were consistently used as loafing areas for one or more (occasionally 20 or 30) birds.

Four localities (Fig. 1) generally had large eagle concentrations after most of the river and its backwaters were blocked with ice (Table 1). Two of these were open areas about 1.5 miles apart on the main channel. In most instances eagles were observed perched in trees, but, with some regularity they were also seen standing on the ice or on the beach. The size of the open holes varied with the severity of the weather. One was closed completely during a brief but extremely frigid midwinter period. Increased water flow resulting from warmer weather upstream tended to enlarge the open holes. The result

of very low temperatures, therefore, was not always a reduction in the amount of open water in the main channel.

Two other areas located near the center of the study area had sizable eagle concentrations. One was a slough with open water along the mainland bank. The open water was a result of seepage from small springs in the bank. The warmer water which entered the slough retarded freezing. Nearby Palisade outcroppings of Saint Peters Sandstone (approximately 900 feet above river) probably influenced spring flowage. The width of the open water varied from a few inches to 12 or 15 feet depending on the temperature, and the depth gradually increased to 30 inches. Occasionally open water occurred along a mile or more of shoreline although it was normally restricted to a series of distinct holes scattered along approximately 100 yards of beach.

The remaining area was near two culverts through which water from Crooked Slough flowed with enough force to maintain an open hole of some size throughout the study. During the winter the hole was as large as 100 by 30 yards and as small as 25 by 8 yards. This area was adjacent to the one described immediately above.

FOOD AND FEEDING HABITS

The extremely abundant Gizzard Shad (*Dorosoma cepedianum*), three to four inches in length, were the primary food of the eagles, but occasionally small carp (*Cyprinus carpio*) and buffalo (*Ictiobus* sp.) were taken. Throughout most of the winter the open holes along the shore were literally choked with shad probably as a result of the intolerance of the species to reduced amounts of oxygen or to decreased temperatures as was reported for the American Shad (*Alosa sapidissima*) by Tagatz (1961). Many were dead or dying and the live ones often swam near the surface or in very shallow water. The fish are relatively weak swimmers and were thus vulnerable when exposed to sudden changes in current. The result was an almost constant and readily available food supply for the eagles.

The eagles preferred live fish and attempted to catch them, even with quantities of dead ones available on the ice or in the water. In areas where the water flowed most swiftly the shad, on occasion, became helpless, turned on their silver sides, and approached the surface. This was apparently when the eagles caught them. Four methods were used by Bald Eagles to capture live shad or other fish.

1) Swooping from a perch and striking at fish with the talons. This method provided success no more than 25 per cent of the time. If a bird caught a fish it flew to the ice or nearby tree and consumed its catch. Often other adults or immatures attempted to steal the fish. In fact, immatures seemed more eager to take fish from adults than to capture their own.

2) Flying back and forth or circling over open water, and then swooping down and striking with the talons. This method was no more, and possibly less, successful than Method 1.

3) Standing on the edge of the ice and reaching into the water with talons or beak. Although this method seemed somewhat successful, very few eagles used it.

4) Wading in shallow water and catching fish with the beak. This method was used along the shore of the main channel, its backwaters, and the running water of Crooked Slough. It was the most successful manner of feeding. Adult eagles, and occasionally immatures, waded up to their bellies in water and characteristically submerged their heads when capturing fish. I watched one adult capture and swallow at least 10 shad, head end first, in two minutes. The eagles were most wary while in this situation. Sometimes the body and flight feathers were so wet that the bird had difficulty taking flight.

Even though Methods 1, 2, and 3 provided fewer fish during a specific amount of time than Method 4, each was successful enough to satisfy the requirements of the birds. Each method seemed to be particularly suited for, although not always used during, certain feeding conditions (e.g., depth of water, size of open area, etc.).

Another source of eagle food was supplied by the activity of commercial fishermen, who discarded quantities of rough fish during their operations, these being placed in piles or scattered on the ice. On 7 January, we saw 10 eagles feeding on one pile of fish and three on another. Although the commercial fishermen related that eagles swooped down and removed fish from their ice-boats and fed on piles of fresh fish while they were still nearby, we found the birds too wary to approach such piles until several days had elapsed. It is possible that food was more plentiful this winter than it had been during previous years and, therefore, the birds did not have to rely upon this food source.

Common Crows (*Corvus brachyrhynchos*) fed on our bait and more commonly on the dead shad at the open holes. It was not unusual to see as many as 150 Crows in such feeding places. Often eagles fed simultaneously.

About 300 Common Mergansers (*Mergus merganser*) and a few Common Goldeneyes (*Bucephala clangula*) wintered in the area. Their presence seemed to have little influence on the eagles. We observed eagles make several unsuccessful attempts to capture mergansers. The ducks, appearing to sense an eagle's attack, dived quickly as it approached. The ability to dive quickly apparently permitted mergansers and eagles to use the same food supply but prevented mergansers from supplementing the eagles' diet. That eagles will take birds of this size is evidenced by my observation on 26 December 1956, near Charlevoix (Charlevoix County), Michigan. An adult Bald Eagle

swooped down, struck, and carried off an adult Herring Gull (*Larus argentatus*) that was one of several standing on the ice of Lake Charlevoix.

During our trapping attempts bait of various types was used. The eagles preferred rough fish (carp, buffalo, etc.) to frozen shad. Several hundred pounds of frozen carp were used during the project. Several days always elapsed before our bait was eaten. Often one or more eagles remained perched in trees near a pile of fish for most of the day and seemed to watch the bait. Although we could not be certain, it seemed that the same group of birds watched the fish for the period prior to feeding.

Two dead deer that we used for bait were completely devoured. Almost two weeks elapsed between the time the bait was put out and the time when the first eagle fed on it. Immatures fed most actively on this bait and scattered hair over an area of several feet. Rib cartilages and the distal bony portion of ribs were also consumed. On one occasion I observed two deer leave the woods and start across the main channel of the river. An immature eagle that was flying past detoured and slowly circled low over the second deer. The eagle followed the animal halfway across the river and at times was no more than 6-8 feet above it. On several occasions during this period the bird's behavior suggested, to me, that it might attack the deer.

There appeared to be a definite correlation between the degree of eagle concentration and the availability of shad. However, large numbers (more than 25) of birds did not seem to feed in one area for a long period of time. This was probably due to the aggressiveness shown by some adults and most immatures. Conflicts and pursuits were common within large congregations even though food was plentiful.

CENSUS METHODS AND RESULTS

An improved Army road paralleled the study area (Fig. 1) and several side roads ended at the river (total distance of roads, 19 miles). The distance from the River Road to the Mississippi River varied from about 25 yards to almost two miles. The river, sloughs, or backwaters bordered the west side of the road for all but about two miles of its length. Eagles were censused along this route by the direct count method from an automobile, thereby reducing the chances of flushing birds and duplicating our count at another site. Censusing was aided by use of 8×30 binoculars and a $20\times$ scope mounted on the auto. Eagles visible on both sides of the river (Iowa and Illinois) were recorded. Possibly on occasions we overlooked eagles because we did not walk into areas not readily observable from the road. Therefore, some of our census figures may have been slightly lower than the actual population. We were, however, confident that our count was not greater than the number of birds present.

We censused the population during 41 of the 53 days spent in the area between 27 November 1961, and 1 April 1962. On some days we did not count the birds because our work at trap sites had altered the number of birds present. The results of this census are presented in Fig. 2. No attempt was made to smooth the curve since the points represent the actual number of birds counted and since irregular periods elapsed between counts. This method provided an accurate indication of the population fluctuation and also permitted a comparison with our weather data.

Several factors obviously affected our counts. On clear sunny days when the temperature began to rise about noon and the thermals were optimum, many eagles were observed soaring over the river, woodlands, and bluffs. It was often noticeable on such days that the birds were more dispersed during the morning hours. Increased amounts of Army traffic along the River Road reduced the number of birds in the areas of disturbance. Also, the availability of food, at particular feeding sites, varied with the changing ice conditions (Table 1). We were unable to explain the somewhat sudden increase or decrease in numbers during a particular day. For example, on 2 February, at 1030 we recorded 98 adult Bald Eagles, but when we made a second count at 1230, to demonstrate our technique to Herbert Troester of the Fish and Wildlife Service, we recorded 262 Bald Eagles, eight of which were immatures. Three Golden Eagles (*Aquila chrysaetos*) were also present. At the first open hole (Fig. 1) we counted 103 adult and eight immature Bald Eagles; at the second there were 95 adults; at the other two open areas there were 11 and 32 adults; and the remaining 12 birds were observed in trees along the road. For some reason the birds congregated in trees along the bank in larger groups than usual. Often there were eight or ten perched in one tree. I doubt that such an increase indicates a northward migration as Fawks (1961:54) suggested. Instead, it may represent the result of a particular set of climatic conditions which caused the eagles, previously dispersed throughout the extensive slough areas, to congregate at the open holes within the census area. On this occasion the sky was overcast and a light rain was falling, but these conditions were experienced on other occasions without noticeable effects on the density of eagles.

Evidence that may be purely coincidental but that cannot be ignored lends some validity to the idea of a northward migration on 2 February. On 29 January, ice was breaking up on the Mississippi near Cairo (Pulaski County), Illinois, and ice-breakers were in operation. These conditions may have caused wintering eagles in the area to move northward in search of more suitable feeding areas. It is possible for eagles to make the 400- to 500-mile trip in time to boost the Savanna census on 2 February. The presence of other

feeding areas south of the Depot, however, makes this possibility highly improbable.

The peak population was reached by 12 January, approximately two weeks after maximum ice conditions (Table 1), and was maintained until 23 February, after which a steady decline was noticed until 1 April, when no eagles were seen. It is likely that the highest count (262) recorded on 2 February, approached the figure for the actual population of the area. Fluctuations during the peak period probably were the result of factors previously discussed. Although three- or four-day periods of warmer weather were occasionally followed by the observation of increased numbers of eagles, we were unable to definitely correlate weather conditions or the amount of open water, and thereby food, with the number of birds observed. Needless to say, these factors are important and undoubtedly influence the suitability of the area to wintering eagles but the daily changes did not appear extreme enough to account for the variation in census figures.

ROOSTS

Roosts were noted on two or three occasions, and birds were heard calling from these areas after dark. Each roost was in large deciduous trees and near feeding areas. Birds disturbed by one of us walking into a roosting area failed to return to that particular site. Several times at dusk we watched eagles flying in one by one to roost; but a massive flight, or an indication that all eagles in the area used one roost, was not evidenced. There was no indication that they left the study area to roost.

NUMBERS OF IMMATURES

The numbers of individuals in both age groups varied throughout the winter. During late winter and to some extent early winter (Fig. 2) a larger percentage of the total number of eagles were immatures. As winter progressed the overall proportion of immatures to adults decreased. Comparing the largest number of immatures (15 on 25 February) with the greatest number of adults (254 on 2 February) recorded at any time during the winter the proportion of immatures to adults was 1:17.

Observations of the eagles wintering at Horseshoe Lake (Alexander County) in southern Illinois indicated a much higher proportion of immatures. On 26 December 1961, we counted 15 adults, 19 immatures, and seven of unknown age. Similar figures were available for 1960; on 29 December, we counted 14 adults and 12 immatures (46 per cent immatures). These figures indicated a tendency for immatures to range farther south. Possibly this tendency coincided with the movements of, and wintering areas for, waterfowl. On several occasions at Horseshoe Lake we observed immatures feeding

on Canada Geese (*Branta canadensis*). No kills were witnessed and the geese were not startled by the movements of the eagles.

As a result of our work I am of the opinion that the proportion of immature Bald Eagles to adults cannot be obtained by censusing birds wintering in the Mississippi Valley bordering Illinois because these areas are apparently not equally suitable for both age groups; nor can a realistic view of the reproductive success of the species be obtained by this method. Moreover, it is not possible to determine accurately the movements of birds having unusual plumage (e.g., white coverts) as suggested by Fawks (1961:59). Careful and prolonged observations of eagles in the Savanna area indicated such variations were more common than expected and might be related to age. During one morning we observed three immature eagles with white coverts and partially white underparts. Two were observed simultaneously. Had these birds been observed singly we might have assumed that they were the same individual. This particular type of plumage variation, with modifications (e.g., a white triangular patch on the back), was recorded several times during the winter.

TRAPPING METHODS AND RESULTS

During the winter we experimented with a variety of trapping techniques. Although eagles were caught in but one type of trap, I am confident that additional methods, described herein, will work satisfactorily under proper climatic conditions.

The trap in which we finally captured eagles was a modified Bal-Chatri which I called a platform snare. The platform was a two-foot-square section of hardware cloth (mesh $\frac{1}{2}'' \times 1''$) to which we attached approximately 75 nylon snares. The snares were constructed from 60-pound-test transparent monofilament fishing line. The knots were coated with Duco Cement at the point of attachment between snare and platform. This caused the snares to stand more erect, increasing the chances of a bird's foot entering the loop. The four- to five-inch-diameter loops were arranged so that they overlapped slightly.

Platforms were placed in areas of eagle concentrations: near piles of dead fish or deer used for bait; on river or slough edges where the birds landed or walked; and in the water where they waded in search of food.

The main disadvantage of this trap was noticeable when we used it on ice or on snow-covered beaches. Often the platform became embedded in ice or crystallized snow and made the loops inaccessible to walking birds, or prevented them from closing. Light snowfalls did not affect the operation of the snares.

Two adult eagles were caught in snares set in the water at Crooked Slough. This was one of the places where, during late winter, the eagles waded in search of fish. Several other birds were caught in the snares, but the banks

of the slough and debris sometimes concealed trapped birds and they escaped before we reached them.

Platforms were placed on the bottom in three to six inches of water. The metal portion of the trap was slightly concealed with mud or sand, leaving the nooses protruding. While wading, the eagle entangled its toes in the nooses and its next step resulted in the noose being pulled tight. On each occasion the bird was caught by only one or two toes. Attached to the trap was a two- to three-foot piece of flexible wire which was, in turn, attached to a five- or six-pound weight. This permitted the bird to move the platform, reducing the chances of its pulling out of the trap or injuring itself.

Baits of various sorts (frozen fish, deer) were tried in attempts to lure eagles to trap sites; but, because the birds were hesitant to feed on our bait, none was captured at these sets. Usually the birds waited several days before feeding on our bait, and in the meantime it was necessary for us to close our traps and return to the University. When we returned to the area the bait was usually gone and had to be replaced. During previous winters extensive commercial fishing operations were conducted within our research area. According to fishermen and Depot guards the eagles fed on the trash fish (game fish or unmarketable species or sizes) thrown on the ice, often while the fishermen were still nearby. If these operations had continued this year our success at bait sets may have been better. On two occasions early in the winter before shad were numerous we observed 3-13 eagles grouped closely together feeding on piles of fish.

Because of our observation we decided to use a cannon net. We placed it on the ice where we had observed the eagles feeding and baited the area heavily with fish. The brown net contrasted with the white snow and ice and caused the birds to withdraw from the area, so we attempted to camouflage it by attaching white cloth to the lead edge. We also put canvas under the net to prevent it from freezing into the snow and ice. Inclement weather nevertheless harassed the use of this equipment. Later the net was placed along the shore of an open hole where the eagles were feeding. We also tried to use a mounted eagle and crows as decoys but each attempt failed. If food had been more scarce and if the eagles were required to feed in more specific areas, I believe that the net would have worked.

Steel traps were also used. That these proved unsatisfactory possibly meant that we used sizes (numbers 1 and 1½) too small for eagles. On several occasions traps were sprung at bait sites or water and beach sets but never did it appear that a bird was even momentarily caught. The springs of the traps were weakened and the jaws padded with friction tape. Larger traps were not used because of possible injury to the birds. Changing weather conditions

TABLE 2
CAPTURE, MARKING, AND REPORT DATA OF BALD EAGLES IN 1962

Date	Age	Sex	Band number	Locality captured	Color-markings	Reports
17 February	A	M	528-98106	Hampton, Illinois (Lock and Dam 14)	Rectrices and primaries orange	18 February; near Burlington, Iowa by Mr. Clark Archer.
25 February	A	F	No Band	Savanna, Illinois (Lock and Dam 12)	Rectrices yellow	None
4 March	A	F	509-52601	Savanna, Illinois (Lock and Dam 12)	Rectrices red	26 March; 8 miles south of Rapid City, South Dakota by Mr. Alfred Stein.

and an abundance of raccoons (*Procyon lotor*) hampered the use of this method.

Various modifications of nylon snares were also tried. Nooses were designed to encircle large (10- to 12-inch) shad in such a way that the foot of a bird striking the fish would penetrate the loop and cause it to close. The free end of the line was fastened to a weight on the river bottom. The fish were eviscerated and filled with styrofoam of a size and shape that made the fish float in a normal fashion or on its side as we desired. We placed the rigged fish in the open water of the main channel and Crooked Slough before daylight (the general practice for setting and servicing all of our traps). The eagles failed to show interest in bait so arranged.

During the project three Bald Eagles were caught and color-marked. Two were captured at the Savanna Army Depot and a third by the assistance of Peter Petersen, Jr., at Hampton, Illinois (Table 2).

After removal from the trap the eagles were hooded and placed in long knit cones for transit to the automobile. This method worked well, reducing the bird's struggling and thereby the risk of injury to it and to the investigators.

At the car the bird was weighed, measured, sexed by cloacal examination, banded with Fish and Wildlife Service lock-on bands, and finally released. The entire operation required about one hour.

Dyes obtained from the National Analine Division of Allied Chemical Corporation were used for marking. Three of the colors (wool orange, fast crimson, fast light yellow) recommended by Allen Duvall, Patuxent Wildlife Research Center, were used. The recommended mixture was one ounce of dye and one-half ounce of detergent (Lestoil) diluted in one quart of warm water. Application was with a synthetic sponge. Although we had worked out an elaborate color-code it was apparent, when we caught our first bird, that we would not be marking as many as originally planned; therefore, we discarded

our code and marked the tail of each bird a solid color. Petersen also marked the primaries of the Hampton bird.

REPORTS OF MARKED BIRDS

Three individuals reported seeing marked eagles. One report from Moline, Illinois, was invalid because the exact pattern of the marking could not be reported. The two reports I considered valid appear in Table 2. The report from South Dakota is of special interest since it suggests a funneling of birds into the Mississippi Valley from a wider belt of the Northern United States and Canada than I previously suspected. To my knowledge, these are the first substantiated reports of the movements of marked live Bald Eagles.

SUMMARY

A study of eagle populations was conducted during the winter of 1961-1962, in northwestern Illinois.

The eagles concentrated near four areas of open water along the Mississippi River and its backwaters. These areas remained open throughout the winter and an abundance of food was present. The primary food was live Gizzard Shad. Four methods were used by eagles to capture fish. Frozen fish, deer, and ducks were also consumed by the eagles.

Eagles were censused during 41 of 53 days. The largest number recorded on a single day was 262. The population varied considerably, but the peak was reached by 12 January and was maintained until 23 February. All of the eagles had departed by 1 April.

Roosts were located, but only a few birds were there; the same area was not used by the eagles throughout the winter.

The number of immatures sighted on any one day was 15. The overall proportion of immatures to adults was 1:17. More immatures, in proportion to adults, were observed farther south in the state.

Several eagles with similar plumage variations were recorded; hence, such birds cannot be positively identified by observers.

A variety of techniques was used in attempts to capture eagles. Three adults were trapped and color-marked. Two of these were caught in platform snares.

Two validated reports of color-marked live eagles were received. One report was from South Dakota.

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