

**WINTER RAPTOR
SURVEY**

1977

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Report of the State Preserves Board

December, 1977

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Introduction

Dean M. Roosa
Des Moines, Iowa

Iowa has historically been an important wintering ground for numerous species of raptors, especially the Rough-legged Hawk, which migrate into the state from the arctic. During the early winter of 1976, it was clear that the normal number of Rough-legs was not present in Iowa. It was unclear if this was a response to weather, our continuing habitat destruction or changing conditions on their breeding grounds. After discussions with James Dinsmore, Irv Klaus and Pete Petersen, it was decided to make an initial attempt at a winter survey. The results of that first survey are reported herein. I hope that the survey can be expanded and refined in the future to provide a population estimate of certain species, trends in wintering populations, habitat requirements and utilization, and, as an ultimate goal, management recommendations to help protect this resource.

Over 50 persons participated in the first attempted survey; I hope all repeat in 1978. I will send quadrangle maps to many of the 1977 participants for better habitat correlation. We need more observers, especially in the southern, rolling portion and in the western loess hills region.

A special tribute is due the students of the Animal Ecology Department of I.S.U., who, under the supervision of Drs. Dinsmore and Klaus, surveyed over half of Story County.

I was fortunate in having Paul Bartelt assist with the compilation. Paul recently finished his master's degree on the Goshawk population in the Black Hills and is now with the Iowa Conservation Commission.

It is hoped the compilation of the 1978 survey will occur immediately after the reports are received.

List of Participants in 1977 Survey

Darleen Ayres	Ottumwa
Maurice Baker	Clarion
Beth Baker	Clarion
Jim Bednarz	Ames
Craig R. Beyer	Holstein
Gladys Black	Pleasantville
Jack Bobenmeyer	Rockwell City
David Bowles	Pella
Lynn Braband	Ames
Gary Brandenburg	Albion
Dorothy Brunner	Nora Springs
Bob Bryant	Davenport
Gene Burns	Jamaica
Lloyd and Gay Crim	Centerville
Jim Dinsmore	Ames
Bob Dolan	Onawa
Steve Duecker	Danbury
Rich Fahlgran	West Burlington
Larry Farmer	Westfield
Gary Frazer	Ames
Bob Frederick	Ames
Dave Fulks	Evansdale
Doug Harr	Lester
Bill Husinkveld	Centerville
Glenn Jones	Rockwell City
Jerry Kessler	Castana
Deb Kessler	Castana
Darwin Koenig	Decorah
Kent Korthas	Ames
Curt Kreiger	Marshalltown
Fred Leshner	La Crosse
Randy Maas	Story City
Tomma Maas	Story City
Mike Newlon	Iowa City
Carol Newlon	Iowa City
Tom Nigus	Ames
Margie Plouffe	Ames
Thomas Pray	Ames
Mark Ryan	Ames
Dean Roosa	Ames
Joe Schaefer	Ames
Joe Schaufenbuel	St. Lucas
Ross Silcock	Malvern
Jim Sinclair	Pella
Bill Smith	La Crosse
Rick Snyder	La Crosse
Tom Sorenson	Onawa
Dean Stauffer	Ames
Jon Stravers	Pella
Pete van der Linden	Ames
Lowell van der Molen	Pella
James Vogler	Ames
Paul Willis	Thornton

Winter Raptor Populations in Iowa

Iowa has historically been an important wintering-grounds for a number of species of raptors. The common buteo seen hovering or soaring over open fields during the winter, especially the months November through March, is the Rough-legged Hawk (Buteo lagopus sancti-johannis). This species nests between latitude 76° and 61°; in North America, this is north of a line through northern St. James Bay. Winters south into central United States.

The common buteo seen near woodlands or woodland edges is the Red-tailed Hawk (Buteo jamaicensis borealis). This bird breeds over all of the eastern United States and adjacent parts of southern Canada. Many of the nesting pairs remain on their territory throughout the winter; the immatures generally migrate south, but a small percentage can be found in Iowa, usually in the southern part. The western Red-tailed Hawk (Buteo j. calurus) enters Iowa from the west, but its distribution and abundance in Iowa has not been assessed.

The common small falcon seen perched on telephone or high-line poles or on high-line wires is the American Kestrel (Falco sparverius); this bird breeds frequently in Iowa and a small percentage of the birds can be found in Iowa in winter, although whether these are Iowa breeding birds or not is unknown.

The common large owl seen flying through the trees in the woodlands in winter is the Great-horned Owl (Bubo virginiana), common breeding bird that normally remains on its nesting territory throughout the winter.

The above birds form the bulk of raptor sightings in winter; others, somewhat less common, use Iowa as winter habitat and will be described in following categories.

RAPTORS FOUND IN IOWA ONLY IN WINTER

ACCIPITERS

Northern Goshawk (Accipiter gentilis). Basically a bird of boreal forests of southern Canada, with a few nesting records from northern Wisconsin. During certain years when the food base in the north is at a low, sizeable migrations into Iowa occur. This bird, like the two smaller accipiters, is found in wooded terrain.

BUTEOS

Rough-legged Hawk (Buteo lagopus). Described above. There are two color phases of this species and much individual variation. The broad dark terminal band on the whitish tail, the dark markings at the bend of the wing, and the dark belly all aid in identification.

Ferruginous Hawk (Buteo regalis). This Great Plains bird, largest of the North American buteos, is only rarely a straggler into Iowa in winter. The "V" formed by the darker-colored legs against the light belly and the whitish tail aids in field identification.

EAGLES

Bald Eagle (Haliaeetus leucocephalus). Nested in Iowa until about the turn of the century. Now the major rivers in Iowa are important wintering grounds, where they arrive in late September and leave in late March or early April. This species is nesting farther south in the Mississippi River Valley in recent years; perhaps it will once again nest in Iowa. Young birds have dark head and tail until about four years of age.

FALCONS

Gyr Falcon (Falco rusticolus). This species, the largest of the falcons, is a very rare straggler into Iowa. It exists in two color phases, the white is most common in Greenland. Nearby states have had recent winter sightings.

Prairie Falcon (Falco mexicanus). Rare straggler from the Great Plains, with records from the western part of the state. This is a light-colored falcon, much paler than even immature peregrine falcons.

OWLS

Short-eared Owl (Asio flammeus). This intermediate-sized owl has a marked preference for marshes and is active just after sunrise and just before dusk. It formerly nested in Iowa, but no nests have been recorded for about 50 years. "Ears" indistinct; black patch near bend of underwing.

Snowy Owl (Nyctea scandiaca). This large, white, visitor from Arctic America surely migrates into Iowa each year, but some years sightings occur in all parts of the state. This large invasion probably occurs in response to a decline to the lemming population, their major food base. Females are larger and have dark flecks in plumage.

Great Gray Owl (Strix nebulosa). This largest of North American owls is a very rare straggler into Iowa. It nests in the boreal forests of Canada and northern Minnesota and is much less wary than most owls.

Saw-whet Owl (Aegolius acadicus). A tiny, tuftless owl seen in Iowa in winter is this species. It has a distinct preference for dense young evergreens and is tamer than any other owl. It occurs in Iowa every winter, but is nocturnal and not often seen.

RAPTORS FOUND IN IOWA DURING MIGRATION AND WINTER

ACCIPITERS

Sharp-shinned Hawk (Accipiter striatus). Near Robin sized, this woodland species migrates through Iowa and a few may remain through the winter. Immatures are brown above, adults slate-blue. Field aids to separate this species from the similar Cooper's Hawk: smaller, with a narrower, more square-cut tail. No nesting records in Iowa for several decades.

EAGLES

Golden Eagle (Aquila chrysaetos). Rare. Usually not seen in Iowa until November. Immatures have white under-wing patches and a broad white tail-band. Immature Bald Eagles are often mistaken for this species. At close range, the feathered tarsus of the Golden Eagle can be seen.

RAPTORS SEEN IN IOWA ONLY DURING MIGRATION

BUTEOS

Harlan's Hawk (Buteo harlani). Rare and difficult to identify. Shape and size of a Red-tailed Hawk. The best field identification is the mottled tail, dark brown on white and never barred. The color phases; I consider the pale phase much more rare in Iowa.

Krider's Red-tailed Hawk (Buteo jamaicensis krideri). A subspecies of the Eastern Red-tailed Hawk. Formerly nested in Iowa (Anderson, 1907, Bailey, 1917, DuMont, 1933). Now rarely seen in migration. Best field aids are the nearly white tail, but always with some barring, the noticeable amount of white on the head and general size and shape of the eastern Red-tail.

OSPREYS

Osprey (Pandion haliaetus). Uncommon migrant; seen mainly along the Mississippi River and less commonly in the interior portion of the state. When seen from below, the noticeable crook in the wings and the black marking on the underwing at the bend are distinctive. When perched, the large size and nearly white head aid in identification.

FALCONS

Merlin (Falco columbarius columbarius). Uncommon migrant, but it slips through Iowa early and unnoticed. Immatures and female brown above, adult male, slate-blue. Best field aid, in addition to the small size, is the barred tail and chunky appearance.

Richardson's Merlin (Falco columbarius richardsoni). Rare straggler. This pale subspecies enters the state as a straggler from the west. This prairie subspecies breeds in the plains west to the Dakotas.

RAPTORS WHICH NEST HERE AND MAY BE FOUND HERE IN WINTER

ACCIPITERS

Cooper's Hawk (Accipiter cooperi). Uncommon breeder and rare in winter. The short, rounded wings and long tail immediately distinguish this species as an accipiter. Adults are slate-gray above; immatures, brown above. Found mainly in woodlands.

HARRIER

Northern Harrier (Circus cyaneus). An intermediate-sized bird coursing low over fields, with wings dihedral while gliding, is a Northern Harrier. The white rump, relatively long wings and tail are very distinctive. Adult males are slate-blue above; females and immatures are brown above. Very rare breeders, common in migration.

BUTEOS

Red-tailed Hawk (Buteo jamaicensis). Our most common large raptor and many pairs remain on their territories year-round. Immatures nearly all migrate from the state. Favorite hunting technique is to perch at a woodland edge and launch upon sighting prey. Immatures have brown tail and strong brown belly-band.

Red-shouldered Hawk (Buteo lineatus). Rare breeding bird and most migrate from the state. Field aids are the reddish "shoulders", narrow tail bands, uniformly-colored underparts (belly, breast, legs, and under-wing), rufous breast, three equal-width white tail bars and white "mirror" at base of flight feathers, visible when soaring.

FALCONS

American Kestrel (Falco sparverius). Any small hawk with a rusty back or seen hovering over open fields, is probably this species. Most migrate from the state. Males (both immature and adult) have slate-blue wing-coverts, secondaries and primaries; females (both adult and immature) are rufous, barred black above. This species often perches on poles along roads.

OWLS

Barn Owl (Tyto alba). Very rare breeder. Unmistakable with heart-shaped facial disc, long legs, and tan coloration above. Inhabits old buildings.

Screech Owl (Otus asio). Any small eared owl, especially in towns or woodlots near habitation is this species. It occurs in two color phases, is mainly nocturnal, and has a tremulous descending call which is unmistakable. A very beneficial species to have near.

Great Horned Owl (Bubo virginiana). Commonest large "eared" owl and most of the large brown birds seen flying below the canopy in woodlands will be this species. Usually mobbed by crows if forced to fly in daytime. This powerful predator begins nesting cycle in late January or early February and can be heard calling in most Iowa woodlands in winter.

Long-eared Owl (Asio otus). Very rare breeder, many more are winter residents. Prefers conifer stands. The only other owl with which it can be mistaken is the Great Horned Owl, but has skinnier, more upright "ears".

Barred Owl (Strix varia). A bird of deep woods, more often heard than seen. Its call almost always consists of eight hoots. Resembles Great Horned Owl in flight, but has no "ears" or "horns". Not nearly as common as Great Horned Owl.

RAPTORS WHICH NEST IN IOWA BUT MIGRATE FROM STATE BEFORE WINTER

VULTURES

Turkey Vulture (Cathartes aura). Nests sparingly in Iowa, but many are found in roosts scattered across the state. Field aids are large black bird which soars with wings noticeably dihedral. The head of the adult is red and has no feathers.

BUTEOS

Swainson's Hawk (Buteo swainsoni). Uncommon breeding bird; winters in Venezuela. General shape and size of Red-tail, but soars with wings dihedral and has a slightly higher pitched scream. Two color phases occur; I feel the dark one is rare in Iowa. A good field aid in the light race is the dark upper breast.

FALCONS

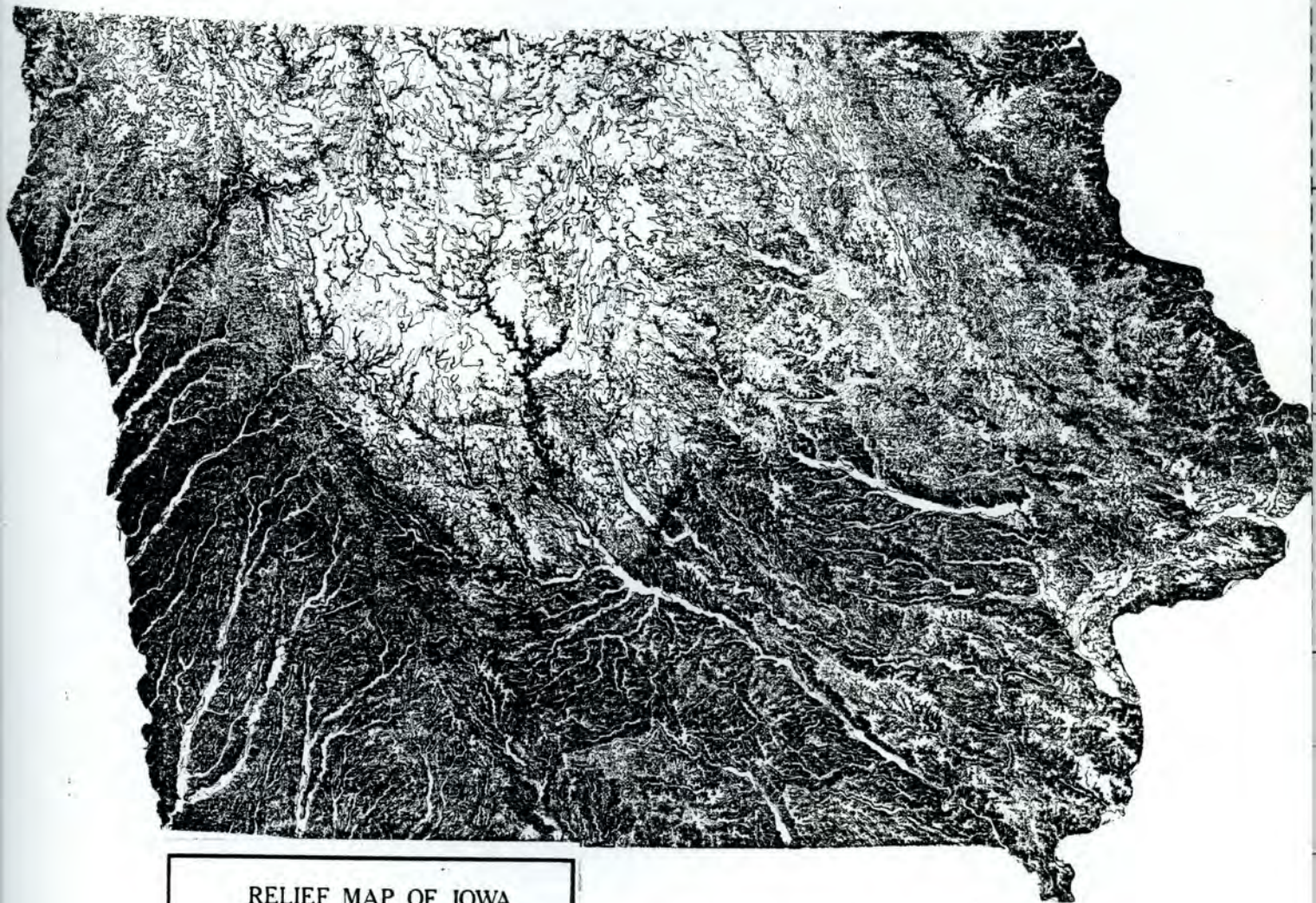
Peregrine Falcon (Falco peregrinus). Very rare breeder and may be extirpated. Has nested on cliffs of northeast Iowa; winters in gulf coast states, south to South America. This species is on the federal endangered species list.

OWLS

Burrowing Owl (Speotyto cunicularia). Very rare breeder; prefers open prairies and may perch on posts along road. More diurnal than most owls. Nests in old animal burrows.

The State

Iowa is basically a flat state with 86.9% of its surface with a slope of 14% or less (Oschwald, et al, Principal Soils of Iowa, 1965). As can be seen on the accompanying relief map (see below), the greatest relief occurs in the extreme northeastern and eastern portion and in the extreme west-central part. Because these areas are unsuitable for agriculture, this is probably the best habitat for several species of raptors (Red-tailed Hawks, Great Horned and Barred Owls, etc.).



RELIEF MAP OF IOWA



BLACK LINE SERIES

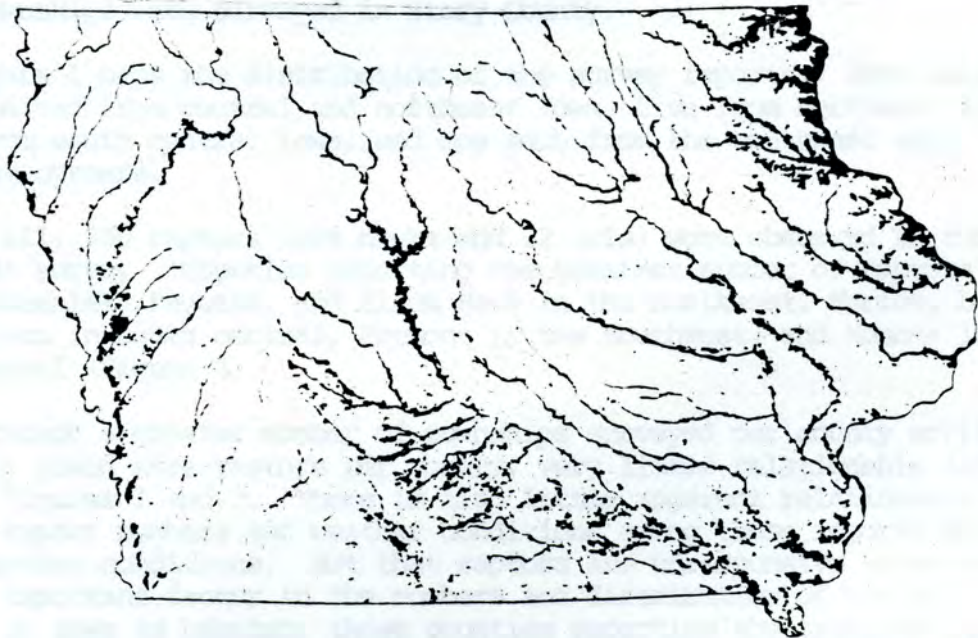
1975

Prepared by
J. R. HALLBERG
R. R. ANDERSON

FROM
1:50,000 NATIONAL TOPOGRAPHIC SERIES MAPS
SCALE 1:50,000

IOWA GEOLOGICAL SURVEY
STANLEY C. GRANT
1975

Iowa was at the time of settlement about 85% prairie (Dick-Peddie, 1953, Proc. Ia. Acad. Sci. 60:112). Forests began encroaching as man prevented forest fires, but, in recent years woodlands have been converted to agricultural areas, housing sites or other alternate uses at an alarming rate. As can be seen in the accompanying map (see below), very little forest cover remains. That which does remain is concentrated in the northeast 'driftless area' and in a belt from Guthrie County southeast to the Mississippi River. These areas should be good wintering habitat for the woodland species of raptors and probably the best nesting habitat remaining in Iowa for such species as the Red-tailed Hawk, Cooper's Hawk, Great-Horned Owl, Barred Owl, etc.



Forest Cover of Iowa
(from Peck, J.H. 1976. Proc. Ia. Acad. Sci
83:147; modified from Ia. Geol. Surv. Land Use Map)

SUMMARY OF 1977 IOWA WINTER RAPTOR SURVEY

The first of planned annual statewide winter raptor surveys was met with enthusiasm by more than 50 amateur and professional Iowa birders. The data reported by these birders were good, although uniformity of reports is needed since the individual methods of reporting varied widely from vague narrative description of a survey to well drawn and colored habitat maps with each raptor sighting mapped. A standardized field form will be presented at the end of this report.

Reports were received from 36 townships in 25 counties and seven breeding bird census routes (Numbers 006, 007, 013, 014, 029, 030 and 034). Breeding Bird Route locations are shown in Figure 5. One township was surveyed in each of 22 counties, two townships were surveyed in each of two counties, three townships were surveyed in Marion County and eight townships were surveyed in Story County.

Figure 1 maps the distribution of the survey reports. Over half were received from central and northeast Iowa, five from northwest Iowa, seven from south central Iowa, and one each from the southwest and southeast corners.

In all, 230 raptors (208 hawks and 22 owls) were observed in the statewide survey. Counties reporting the greatest number of raptors were Winneshiek, Fayette, and Black Hawk in the northeast, Marion, Lucas and Madison in south central, Fremont in the southwest, and Monona in west central (Figure 2).

Although a greater number of townships surveyed per county would seemingly yield more raptors per county, very little relationship occurs between Figures 1 and 2. There is also little apparent relationship between raptor numbers and weather conditions among those reports which noted weather conditions. Not that raptors are unresponsive to weather, but the important factor in the numbers and distribution of winter raptors in Iowa is habitat; those counties reporting the greatest number of raptors have greater amounts of trees, water, and corresponding edge habitat.

Other factors possibly affecting raptor numbers and distribution according to the survey are: (1) the number of observers surveying a township, (2) the thoroughness or speed at which a township is surveyed, and (3) the capability of the individual observers.

The total number of raptors observed statewide is broken down by species and township in Table 1. Diurnal birds of prey comprised 90% of the total 230 observations, while the more nocturnal owls comprised the remaining 10%; one shrike was observed in Story County. Red-tailed Hawks numbered 130 of the total 208 hawks recorded. About 60% of these were adults, many of which were observed in pairs and were probably residents of those areas. Only 4% were immature, since most immature Red-tails migrate south; the age of the remaining 36% was unnoticed or not recorded.

American Kestrels were the second most common raptor observed, with most recorded in the northeast and southeast portion of the state.

Rough-legged Hawks were a close third and approximately an equal number of light-phase and dark-phase hawks were observed.

Few other hawks were reported: four Northern Harriers, three in Marion County and one in Appanoose County; one Cooper's Hawk was recorded in Boone County; nine Bald Eagles, four along the Missouri River in Fremont County, one near the Missouri River in Plymouth County, one in the Pella area in Marion County, and three in Allamakee County near the Mississippi River. Wintering Bald Eagles are commonly observed near portions of the Missouri and Mississippi Rivers which remain ice-free.

The occurrence of two Ferruginous Hawks in Lucas County was unexpected, since these large buteos are common to the western plains. According to the 1971 Annotated Bird List of Iowa by W. H. Brown, only five previous sightings of the hawk in Iowa exist: Dickinson County in 1946, Polk County in 1946, Fremont County in 1951, Grundy County in 1954, and Adair County in 1962. Only the first of these sightings were in May, the others were in fall or winter.

The Great Horned Owl was the most commonly reported owl and was recorded in eight counties throughout the state. Two Snowy Owls were recorded, one each in Black Hawk and Marion Counties.

The most depauperate counties were Lyon, Wapello, Cherokee and Story. The single report from Cherokee County (Silver township) and five of eight reports from Story County reported observing no raptors. The single reports, each from Lyon and Wapello counties reported one owl and two hawks, respectively. The counties with the greatest variety of raptors (i.e., the greatest numbers of raptor species) were Black Hawk and Marion Counties.

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Table 1. Results of Township Surveys

Species	County (Twp)	Allamakee Co. (Lafayette)	Appanoos Co. (Walnut)	Black Hawk Co. (Bennington)	Boone Co. (Pilot Mound)	Carro Gordo Co. (Grimes)	Cherokee Co. (Silver)	Dallas Co. (Washington)	Des Moines Co. (Danville)	Fayette Co. (Auburn)	Floyd Co. (Rock Grove)	Fremont Co. (Scott)	Hancock Co. (Ellington)	Lucas Co. (Warren)	Lyon Co. (Sioux)	Madison Co. (South)	Marion Co. (Pleasant Grove)	Marion Co. (Pleasant Grove North)	Marion Co. (Pella Area)	Marshall Co. (Marion)	Monona Co. (Kennebec)	Monona Co. (Maple)	Plymouth Co. (Sioux)	Polk Co. (Elkhart)	Polk Co. (Madison)	Sac. Co. (Wall L., Viola)	Story Co. (Washington)	Story Co. (Palestine)	Story Co. (Indian Creek)	Story Co. (Nevada)	Story Co. (Wilford)	Story Co. (Lafayette)	Story Co. (Howard)	Story Co. (Collins)	Wapello Co. (Agency)	Winnebago Co. (Bloomfield)	Wright Co. (Grant)	TOTAL
Red-tail		8	1	1	2			3	3	9		10	3	8		14	9	3	7	1	10	12	5	1	3				1			1			2	12	1	130
Rough-leg				4		1			2	2	3								2	2																2		18
Ferruginous														2																								2
Unid. Buteo														2																		1						3
Harrier			1																3						3													7
Cooper's					1																																	1
Bald Eagle		3										4							1				1															9
Kestrel				1				1	1	2	5	1	1			2					3	1		1	2							1						22
G. H. Owl			1	1	1				1						1				3								1											9
Screech Owl				2																	1					1												4
Barred Owl																					2									1							1	4
L. E. Owl																			1																			1
S. E. Owl																			1																		1	2
Snowy Owl				1																																		1
TOTAL		11	3	10	4	1	0	3	6	13	5	19	4	13	1	16	9	3	18	3	16	13	6	2	8	2	0	0	1	0	1	3	0	0	2	16	1	213

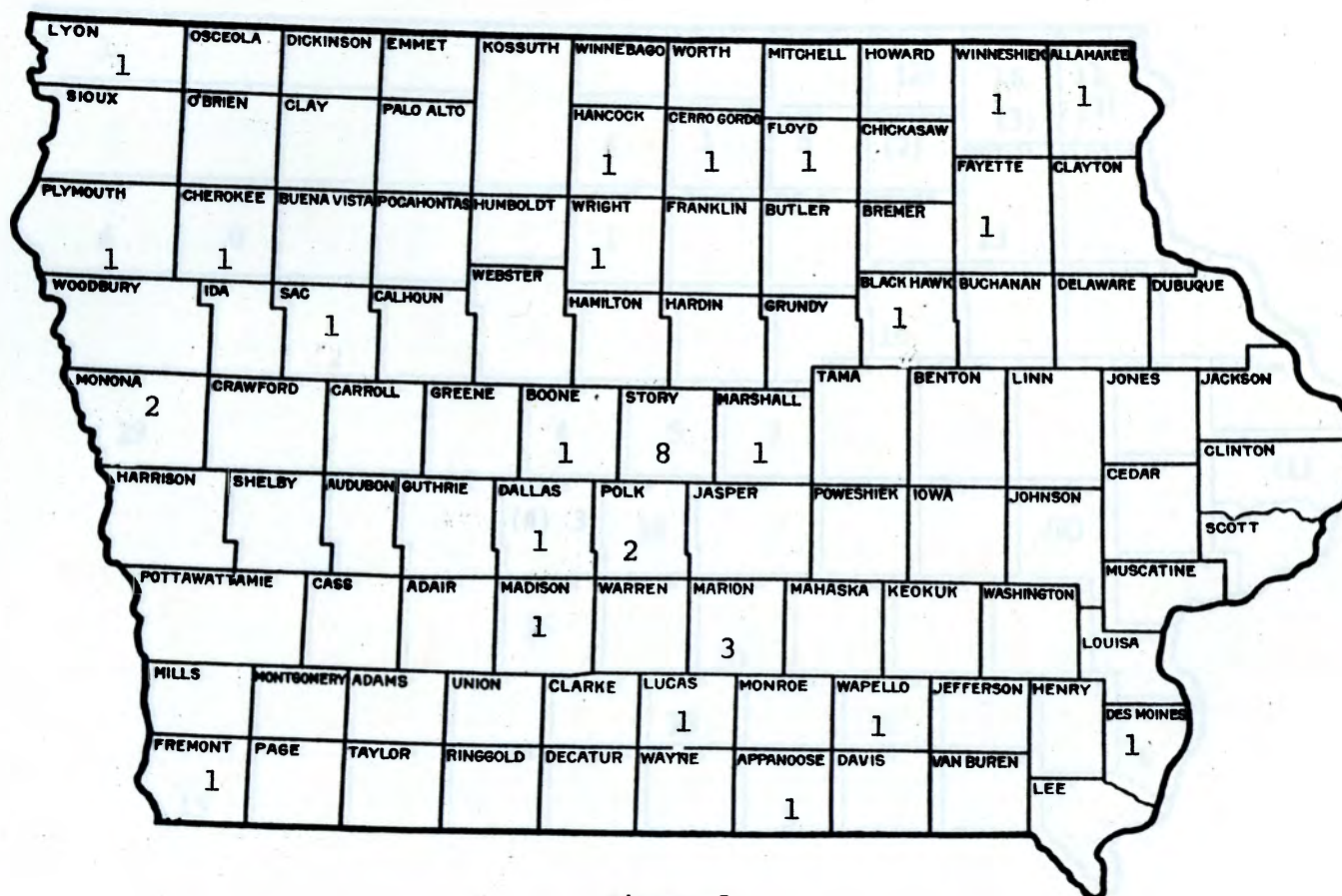


Figure 1.

Location and number of townships surveyed.

Figure 2.
Number and Distribution of Raptors
Recorded in Iowa During Winter 1977
() denotes birds seen on a route

Figure 3.
Number and Distribution of Hawks Recorded
in Iowa During Winter 1977
(Township Survey)

Figure 4.
Number and Distribution of Owls Recorded
in Iowa During Winter 1977
(Township Survey)

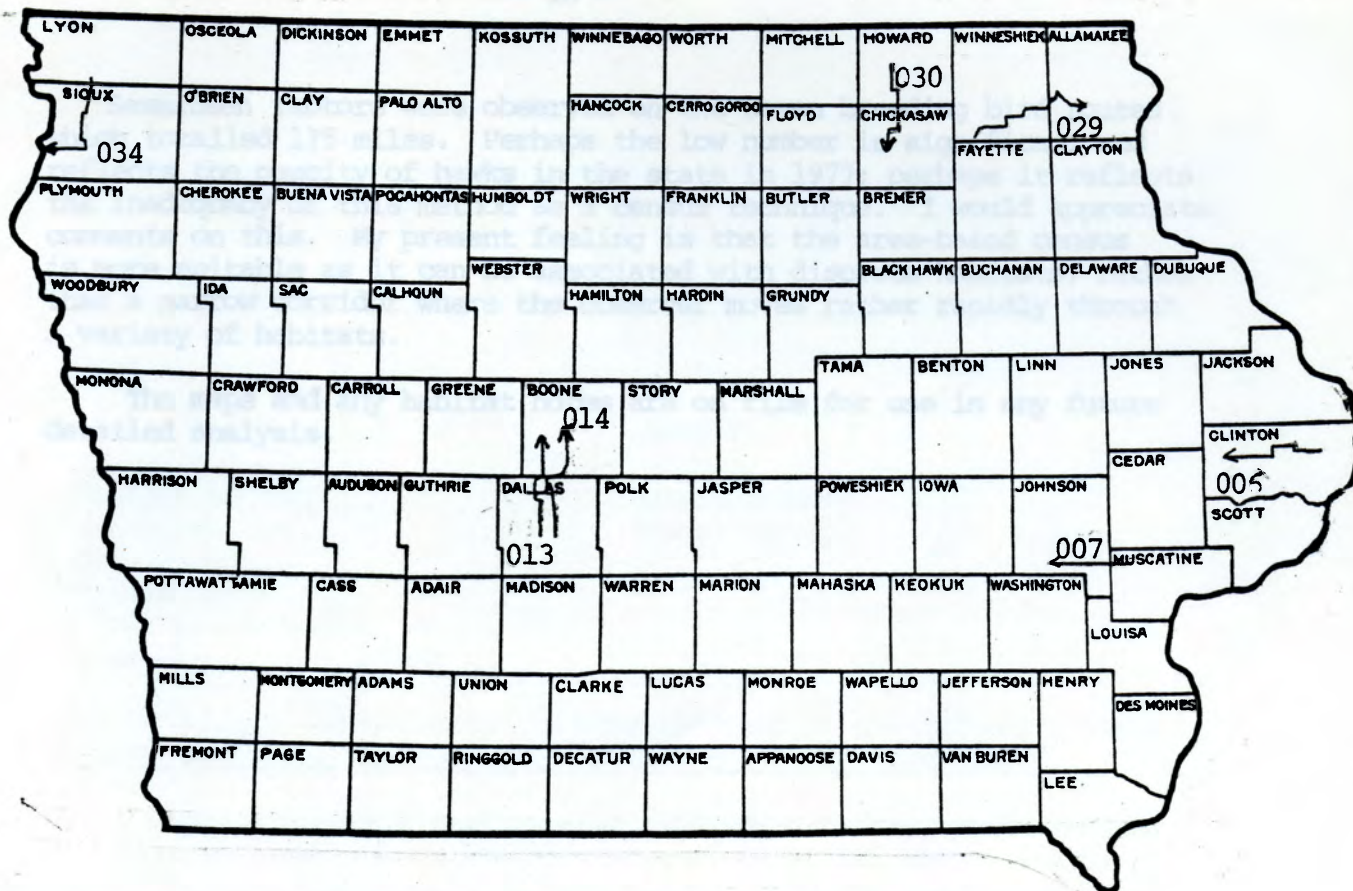


Fig. 5. Location of Breeding Bird Routes Utilized in Hawk Survey

Seven Fish and Wildlife Service Breeding Bird Routes were utilized in an attempt to determine if this would be a viable winter survey census technique. Ten routes were initially randomly selected; observers could be found for only seven. The location of the routes are shown in Fig. 5.

Results

- Route 006. Clinton County. 1 Northern Harrier
- Route 007. Muscatine and Johnson Counties.
1 unidentified hawk; large size.
1 Red-tailed Hawk
- Route 013 Dallas and Boone Counties
4 Rough-legged Hawks (3 dark phase)
- Route 014 Dallas and Boone Counties
No raptors
- Route 029 Winneshiek and Allamakee Counties
6 Red-tailed Hawks
- Route 030 Howard and Chickasaw Counties
3 Red-tailed Hawks
1 Great Horned Owl
- Route 034 Sioux County
No Raptors

Seventeen raptors were observed on the seven breeding bird routes which totalled 175 miles. Perhaps the low number is significant and reflects the paucity of hawks in the state in 1977; perhaps it reflects the inadequacy of this method as a census technique. I would appreciate comments on this. My present feeling is that the area-based census is more suitable as it can be associated with discrete habitats, rather than a narrow corridor where the observer moves rather rapidly through a variety of habitats.

The maps and any habitat notes are on file for use in any future detailed analysis.

Habitat	Code	Prey	Code
upland field	1b	perched	1
pasture (grassy)	2	flying	2
windbreak (less than 20 acres)	3	pursuing prey	3
upland woods	4a	other (specify)	4
river bottom woods	4b		
edge	x/x		

Table 2 lists the number of raptors observed in the different habitat types, and their activity from surveys reporting these data.

About 80% of all raptors were sighted in fields, pastures, and other open areas, about 15% were sighted in wooded areas, and the remaining 4% the greatest number, in edge habitat of woods and open areas. This may reflect the importance of habitat to wintering lone raptors, as well as the limitations of the survey. Probably, windbreaks and woods areas provide cover for raptors to prey during the harsh Iowa blizzards. The great number of raptors observed in woods/field edge areas logical, and probably all raptors use such habitats.

BALD EAGLE SURVEY

During the first week of January, biologists for the State Conservation Commission, under the supervision of Al Farris and Rich Bishop, conduct a survey for waterfowl and Bald Eagles in the interior portion of Iowa and on the Missouri River. This survey is coordinated with a similar effort by the Fish and Wildlife Service, conducted on the Mississippi River during the same period. The same areas are covered each year with basically the same personnel; this should yield trends for Iowa wintering eagle populations and may disclose areas which are vital as roosting or feeding sites.

Following are results of the survey conducted January 3-9, 1977; both State Conservation Commission and Fish and Wildlife Service results are included.

Adult Eagles	Immature Eagles	Unidentified	Total
272	88	2	362

Nineteen survey reports provided information on raptor habitat, or activity, or both. Below is the scheme used for summary of this information:

<u>HABITAT</u>		<u>ACTIVITY</u>	
<u>Type</u>	<u>Code</u>	<u>Type</u>	<u>Code</u>
Plowed field	1a	perched	1
unplowed field	1b	flying	2
pasture (grassy)	2	pursuing prey	3
windbreak (less than 20 acres)	3	other (specify)	4
upland woods	4a		
river bottom woods	4b		
edge	x/x		

Table 2 lists the number of raptors observed in the different habitat types, and their activity from surveys reporting these data.

About 40% of all raptors were sighted in fields, pastures, and other open areas, about 15% were sighted in wooded areas, and the remaining 45%, the greatest number, in edge habitat of woods and open area. This may reflect the importance of habitat to wintering Iowa raptors, as well as the limitations of the observers. Undoubtedly, windbreaks and woods areas provide cover for both raptors and prey during the harsh Iowa blizzards. The great number of raptors observed in woods/field edge seems logical, and probably well represented in this survey. The number of raptors deeper in woods areas may be under represented due to limitations of the car-dwelling observer to visually penetrate the woods. Therefore, such wintering species as Cooper's Hawks, Long-eared Owls, and woods-dwelling raptors may be under-represented.

Subsequent annual winter surveys will hopefully provide enough information to correlate numbers and species of hawks with general statewide habitat, so that Iowa habitat most important to wintering raptors can be estimated.

Table 2.

County and Township	Species	Habitat Type								Activity		
		1a	1b	2	3	4a	4b	5	Edge	1	2	3
Boone (Pilot Mound)	Red-tailed Hawk			1	1					1	1	
	Cooper's Hawk						1				1	
Des Moines (Danville)	Red-tailed Hawk		2						1 (1b/4)			
	Rough-leg American Kestrel	1	1	1								
Fayette (Auburn)	Red-tailed Hawk	1				1	1		5 (1/4a)			
	Rough-leg	2										
	American Kestrel	1										
	Great Horned Owl					1						
Fremont (Scott)	Red-tailed Hawk	1				5			4 (1/4a)			
	Bald Eagle	4										
	American Kestrel	5										
Marion (Pella Area)	Red-tailed Hawk	6					1					
	Rough-leg	1		1								
	Harrier			3								
	Bald Eagle	1										
	Great Horned Owl	1							2 (1/4a)			
	Long-eared Owl					1						
Marshall (Marion)	Snowy Owl	1										
	Red-tailed Hawk					1					1	
Monona (Kennebec)	Rough-leg	1	1								2	
	Red-tailed Hawk	2		6					2 (1/4)			
	American Kestrel	1		1					1 (1/4)			
	Screech Owl	1							2 (1/4)			
	Barred Owl											
(Maple)	Red-tailed Hawk					2	3		7 (2/4a)			
	American Kestrel	1										

Table 2. (con't)

County and Township	Species	Habitat Type							Activity			
		1a	1b	2	3	4a	4b	5	Edge	1	2	3
Plymouth (Sioux)	Red-tailed Hawk	1		3			1			3	2	
Sac (Viola)	Great Horned Owl					1						
	Screech Owl					1						
Story (Indian Creek)	Red-tailed Hawk		1									
(Milford)	Barred Owl								1 (1/4a)			
(Lafayette)	Rough-leg	1										
	Red-tailed Hawk	1										
	American Kestrel						1					
Winneshiek (Military)	Red-tailed Hawk								2 (3/4)	2		
(Bloomfield)	Red-tailed Hawk				5		1		4 (3/4)	9		1
	Rough-leg	2								1		1
	Barred Owl	1				1				1		
	Short-eared Owl	1										
Wright (Grant)							1					
	Totals	38	6	16	8	15	11	2	31 18 (1/4) 7 (2/4) 6 (3/4)	20	13	0
		44				26						

Species Totals:

Red-tailed Hawk	12	4	10	7	10	9	2	25		17	9	
Rough-leg	8	1	2							1	3	
Harrier			3									
Cooper's Hawk						1					1	
Bald Eagle	5											
American Kestrel	8	1	1			1		1				
Great Horned Owl	1			1	2			2		1		
Screech Owl	1				1			2				
Barred Owl	1				1			1		1		
Short-eared Owl	1											
Long-eared Owl					1							
Snowy Owl	1											

Species Totals (cont'd):

	Table 2. (con't)								Activity		
	Habitat Type										
	1a	1b	2	3	4a	4b	5	Edge	1	2	3
Red-tailed Hawk	12	4	10	7	10	9	2	25	17	9	
Rough-leg	8	1	2						1	3	
Harrier			3								
Cooper's Hawk						1				1	
Bald Eagle	5										
American Kestrel	8	1	1			1		1			
Total	38	6	16	8	15	11	2	31	20	13	0

HABITAT

1. cultivated field
 - a. plowed
 - b. unplowed
2. pasture (grassy area)
3. windbreak (less than 20 acres
or scattered trees)
4. wooded
 - a. upland
 - b. river bottom or bank or lake
5. mixed field/wooded, or woods/field edge

ACTIVITY

1. perched
2. flying
3. pursuing prey (type)

TIME

expressed as, eg, 0700 - 1300

TEMPERATURE

specify either °F or °C

DIVERSITY INDEX

$$= \frac{\# \text{ of raptors}}{\# \text{ of raptor spp}}$$

CLOUDS

1. clear
2. < 1/4 overcast
3. 1/4 - 1/2 overcast
4. 1/2 - 3/4 overcast
5. > 3/4 overcast

County:

Township:

Date:

Time:

Observers:

Weather

Wind (mph):

Clouds:

Temperature:

(Precipitation):

Direction:

[illegible]

County:
Township:

Date:
Time:
Observers:

Weather
Wind (mph):
Clouds:
Temperature:
(Precipitation):

Direction:

[illegible]

County:
Township:

Date:
Time:
Observers:

Weather

Wind (mph):

Clouds:

Temperature:

(Precipitation):

Direction:

[illegible]