

**WINTER RAPTOR
SURVEY**

1978

WINTER RAPTOR SURVEY - 1978

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Introduction

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The importance of Iowa as a wintering grounds for raptors becomes more clear with each winter survey. Since the initial survey in 1977, the biogeographical regions for Iowa have been delineated and were used in the analysis of the 1978 survey. The regional approach, coupled with a sizeable increase in participants, has begun to show where raptor concentrations exist. We need intelligent land-use planning, especially in these areas, if Iowa is to continue to be important as a winter habitat for raptors.

In 1978, 119 people in 41 counties participated. This is an excellent response from the public. By looking at Fig. 1, it is obvious that we need observers in the southwest (especially in Pottawattamie, Mills, Montgomery, Page, Adams and Taylor counties), in the southeast (especially in Louisa, Washington, Des Moines, Van Buren and Lee counties) and in the east (Clinton, Jackson, Delaware and Buchanan counties). Some of these counties appear quite suitable and information is needed to establish a data base from which to make a population estimate.

I was fortunate in again having Paul Bartelt aid in compilation; Darwin Koenig assisted, especially in the analysis of raptor populations in the biogeographical regions of Iowa.

We are again printing the 'Winter Raptor Populations in Iowa' as background information, especially for persons who may be participating for the first time.

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.

HARRIERS

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

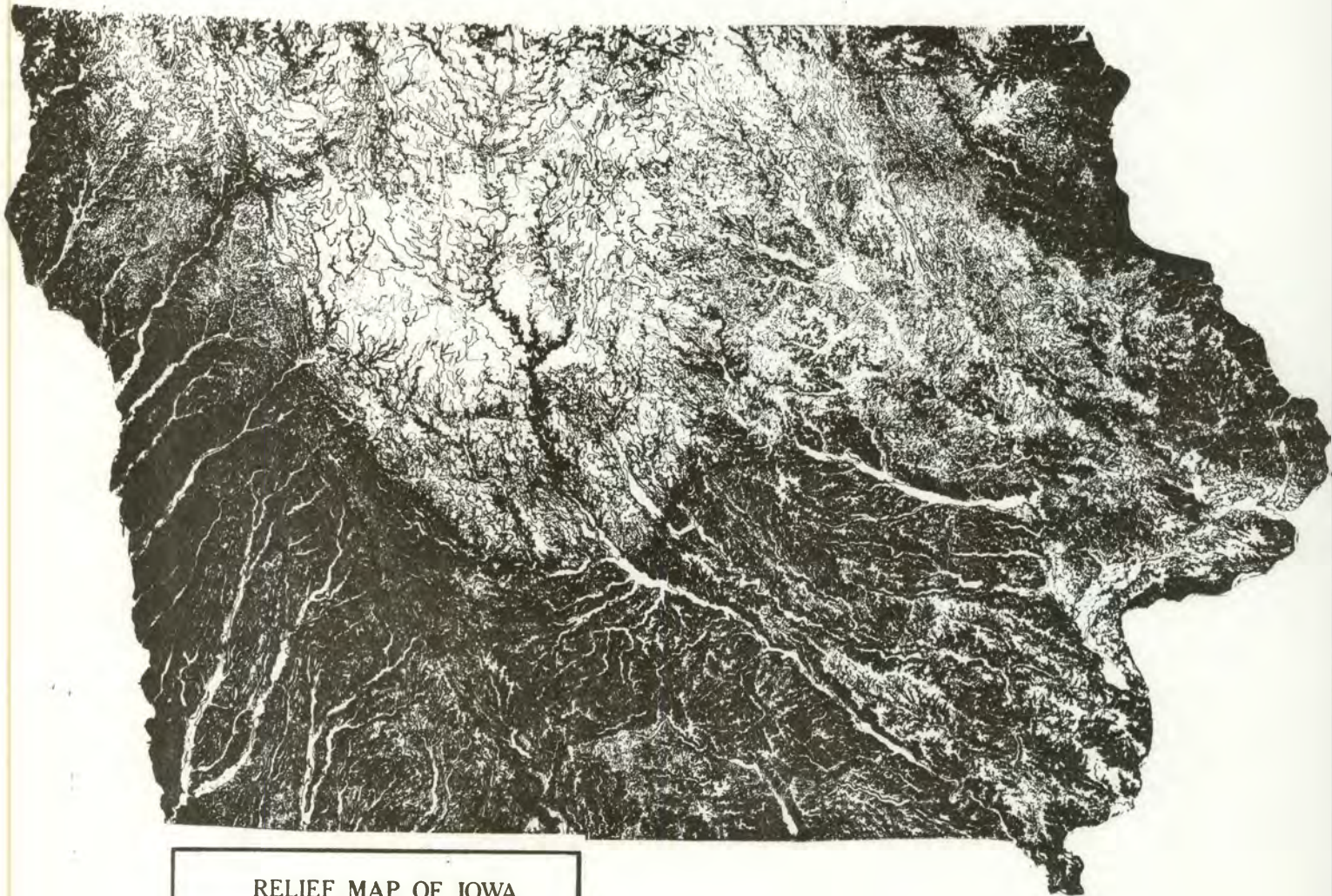
Peregrine Falcon (Falco peregrinus). Very rare breeder and may be extirpated. Has nested on cliffs of northeast Iowa; winters in gulf coast states, south to South America. This species is on the federal endangered species list.

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

SCALE OF MILES
0 10 20 30 40 50

BLACK LINE SERIES

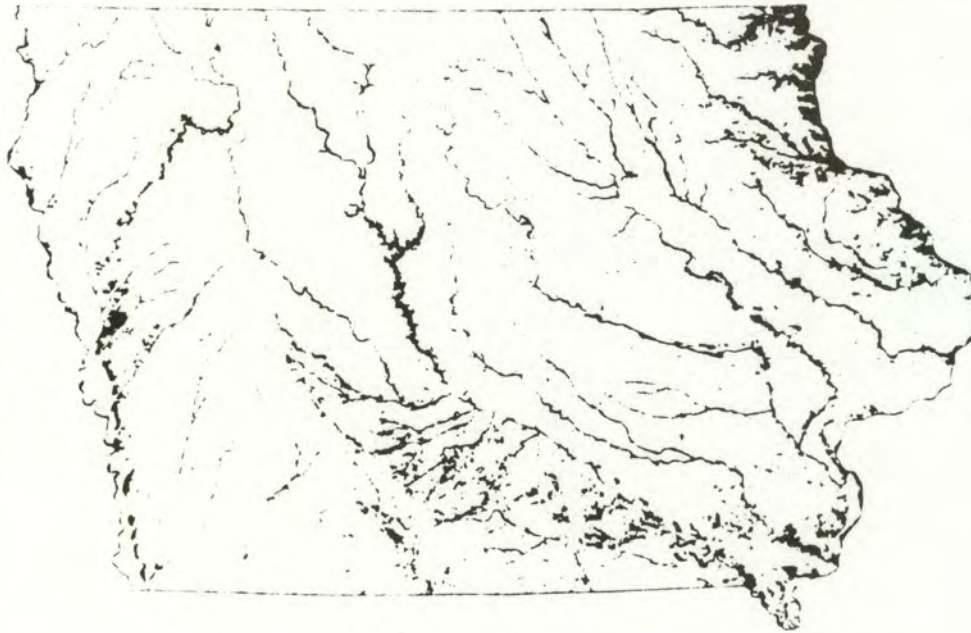
1975

by
D. W. HILLBEND
R. D. ANDERSON

U.S. NATIONAL TOPOGRAPHIC SERIES, MAP

IOWA GEOLOGICAL SURVEY
E. W. HILLBEND
STATE GEOLOGIST

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)

Table 1
List of Counties, Townships, Biogeographical Sections,
and Observers in 1978 Survey

County	Township	Biogeographical Section	Observer(s)
Adair	Grand River	Rolling Hills	Eloise Armstrong Eugene Armstrong Richard Mooney
Allamakee	LaFayette	Driftless Ridge and Valley	Darwin Koenig Joe Schaufenbuel
	Lansing	" "	Ron Andrews Mark Blackburn Kerry Brimmer Jim Peck Bill Smith
	Union City	" "	Darwin Koenig Joe Schaufenbuel
Appanoose	Walnut	Rolling Hills	Bill Heusinkveld Marj Heusinkveld
Boone	Des Moines	Wisconsin Surface	Mel Kacena Mike Koob
	Dodge	" "	Paul Bartelt Gregory Thede
	Pilot Mound	" "	Paul Bartelt Margie Plouffe Gregory Thede Pete van der Linden
	Worth	" "	Dave Newhouse Tom Taylor
	Yell	" "	Marlyne Glasson Clare Smith Hank Zaletel Linda Zaletel
Cerro Gordo	Dougherty	Northern Swell and Swale	Ed Conway
	Falls	" "	Thelma Fromm Curt Nelson Genevieve Nelson
	Grimes	Wisconsin Surface	Paul Willis
	Live Creek	Northern Swell and Swale	Beth McBride Genevieve Nelson Richard Nelson
	Portland	" "	Jan Walter Jim Walter

County	Township	Biogeographical Section	Observer(s)
Cherokee	Silver	Western Plains	Craig Beyer
Clarke	Franklin	Rolling Hills	Darwin Koenig Dean Roosa
	Troy	" "	Brad Wooton
Clay	Gillete Grove	Tazewell Swell and Swale	Craig Cretsinger Mark Vandehaar
	Herdland	" "	Clint Fraley
	Sioux (E $\frac{1}{2}$)	" "	Craig Cretsinger Mark Vandehaar
Clayton	Millville	Driftless Ridge and Valley	Darwin Koenig Dean Roosa
Dallas	Grant	Wisconsin Surface	Paul Bartelt Jim Bednarz
Dubuque	Vernon	Eastern Tabular Uplands	Bob Beck Bob Walton
Fayette	Auburn	Turkey River Hill	Darwin Koenig Joe Schaufenbuel
Floyd	Rock Grove	Northern Swell and Swale	Dorothy Brunner Russell Brunner
Fremont	Scott	Missouri River Alluvial	Ross Silcock
Guthrie	Cass	Wisconsin Surface	Gene Burns Marilyn Burns
	Dodge	" "	" "
	Highland	" "	" "
	Richland	" "	" "
	Seely	Rolling Hills	Gregory Nelson Stephen Patterson
	Victory	Wisconsin Surface	Gene Burns Marilyn Burns
Hancock	Ellington	" "	Dean Roosa
Hardin	Clay	Tabular Uplands	Randy Maas Tomma Maas
Harrison	Raglan	Loess Hills	Robert Dolan Neil Heiser Tom Sorenson
Iowa	Lenox	Tabular Uplands	Tom Sandersfeld
	Hilton	" "	Kerry Phelps Tom Sandersfeld

(Table 1, con't.)

County	Township	Biogeographical Section	Observer(s)
Johnson	Liberty	Tabular Uplands	Loreen Stegenen Jay Stravers
Linn	Jackson	Paha Ridge	Karen Maas Kurt Maas Randy Maas Tomma Maas
Lucas	Warren	Rolling Hills	Gay Crim Lloyd Crim
Lyon	Sioux	Western Plains	Doug Harr
Madison	South	Rolling Hills	Darwin Koenig Dean Roosa
Marion	Pella	" "	Jon Stravers
Marshall	Marion	Swell and Swale	Garry Brandenburg
Monona	Kennebec	Loess Bluffs	Robert Dolan Debbie Kessler Jerry Kessler Tom Sorenson
	Maple	" "	D. Duecker S. Duecker
Muscatine	combination	Tabular Uplands	Allan Hahn
Palo Alto	Emmetsburg	Wisconsin Surface	Rick Martens Dan O'Brien Steve Pitt Rick Sojda
Plymouth	Sioux	Loess Bluffs	Larry Farmer
Polk	Elkhart	Wisconsin Surface	Dean Mosman Diane Mosman
	Madison	" "	" "
Sac	Wall Lake	" "	Eric Anderson Jack Bobenmoyer
Scott	Davenport	Tabular Uplands	Dennis Corbin Mary Lou Petersen Pete Petersen
	Lincoln	" "	Pete Petersen Tom Rennie
	Pleasant Valley	" "	" "
	Sheridan	" "	" "
Story	Collins	Wisconsin Surface	Jim Dinsmore Susan Dees
	Franklin	" "	Gary Bernard Barbara Hill Mark Osterhaus

(Table 1, con't.)

County	Township	Biogeographical Section		Observer(s)
Story	Howard	Wisconsin Surface		Pat Heagy Fred Heinz
	Indian Creek	"	"	Gary Fredrichs Nancy Ross
	LaFayette	"	"	Ellen Johnson Tom Pray
	Milford	"	"	Pat Heagy Tom Nigus Mark Ryan
	Nevada	"	"	Joe Schaefer Bill Ohde
	Palestine	"	"	Bob Frederick Kim Norris
	Richland	"	"	Erwin Klaas Ted LaGrange
	Union	"	"	Sam Eischeid Keith Moore
	Washington	"	"	Jim Bednarz Pat McCrow
Union	combination	Rolling Hills		Brad Wooton
Wapello	Adams	"	"	Nelson Hoskins Tom Johnson
	Agency	"	"	Charles Ayres Darleen Ayres
	Center	"	"	"
	Columbia	"	"	Tom Johnson
	Green	"	"	Nelson Hoskins Randall Hoskins
	Keokuk	"	"	Nelson Hoskins
	Pleasant	"	"	Charles Ayres Darleen Ayres
	Polk	"	"	Charles Ayres Darleen Ayres Nelson Hoskins Tom Johnson
	Richland	"	"	Becky Johnson Tom Johnson
	Washington	"	"	Charles Ayres Darleen Ayres
Webster	Yell	Wisconsin Surface		Dean Roosa

(Table 1, con't.)

County	Township	Biogeographical Section	Observer(s)
Winneshiek	Bloomfield	Turkey River Hill	Darwin Koenig Joe Schaufenbuel
	Glenwood	Driftless Ridge and Valley	" "
Woodbury	Liberty	Missouri River Alluvial	Paul Bartelt Machele Rieke
	Liston	Western Rolling Hills	D. Duecker S. Duecker
Worth	Brookfield	Wisconsin Surface	Thelma Fromm Beth McBride Genevieve Nelson
Wright	Grant	" "	Beth Baker Maurice Baker

Table 2
Results of Breeding Bird Routes Utilized in Raptor Survey

<u>Route No.</u>	<u>County</u>	<u>Observers</u>	<u>Raptors</u>
006	Clinton	Bob Bryant Lee Lee	2 Red-tailed Hawks 2 Rough-legged Hawks
007	Johnson Muscatine	Rich DeCoster Mike Newlon	1 Buteo, sp. 1 G.H. Owl
013	Boone Dallas	Gene Burns Marilyn Burns	2 Red-tailed Hawks
018	Benton Linn	Karl Goellner Ruth Goellner	2 Barred Owl
034	Sioux	Doug Harr Nina Harr	1 Am. Kestrel

Table 4 lists the activity, age and sex of the raptors surveyed, plus the habitat type on which they were observed. The importance of habitat edge to raptors is readily apparent in Table 4. Also shown in Table 4 is the great preponderance of adults in the winter raptor population and, for Am. Kestrels, the greater number of wintering males.

A detailed habitat analysis was given for nine of the townships surveyed. Table 5 gives the percentage of area in each habitat type plus the number of raptors observed on each habitat type for those nine townships. The majority (82%) of the raptors were found on a small portion (24%) of the total environment available to them.

Figure 6 is a map of Iowa divided into biogeographical regions. These regions are based on geological history, glacial influence, bedrock, soils and distribution of plants and animals. Table 6 lists the biogeographical regions and the raptors observed in each of them. Those regions having a rough topography (e.g., Paleozoic Plateau, Loess Bluffs, etc.) have the greatest number of raptors per township. This is due, in part, to the less intensive agricultural pressure exerted in those regions.

[illegible]

Figure 1 No. of Townships Surveyed per County

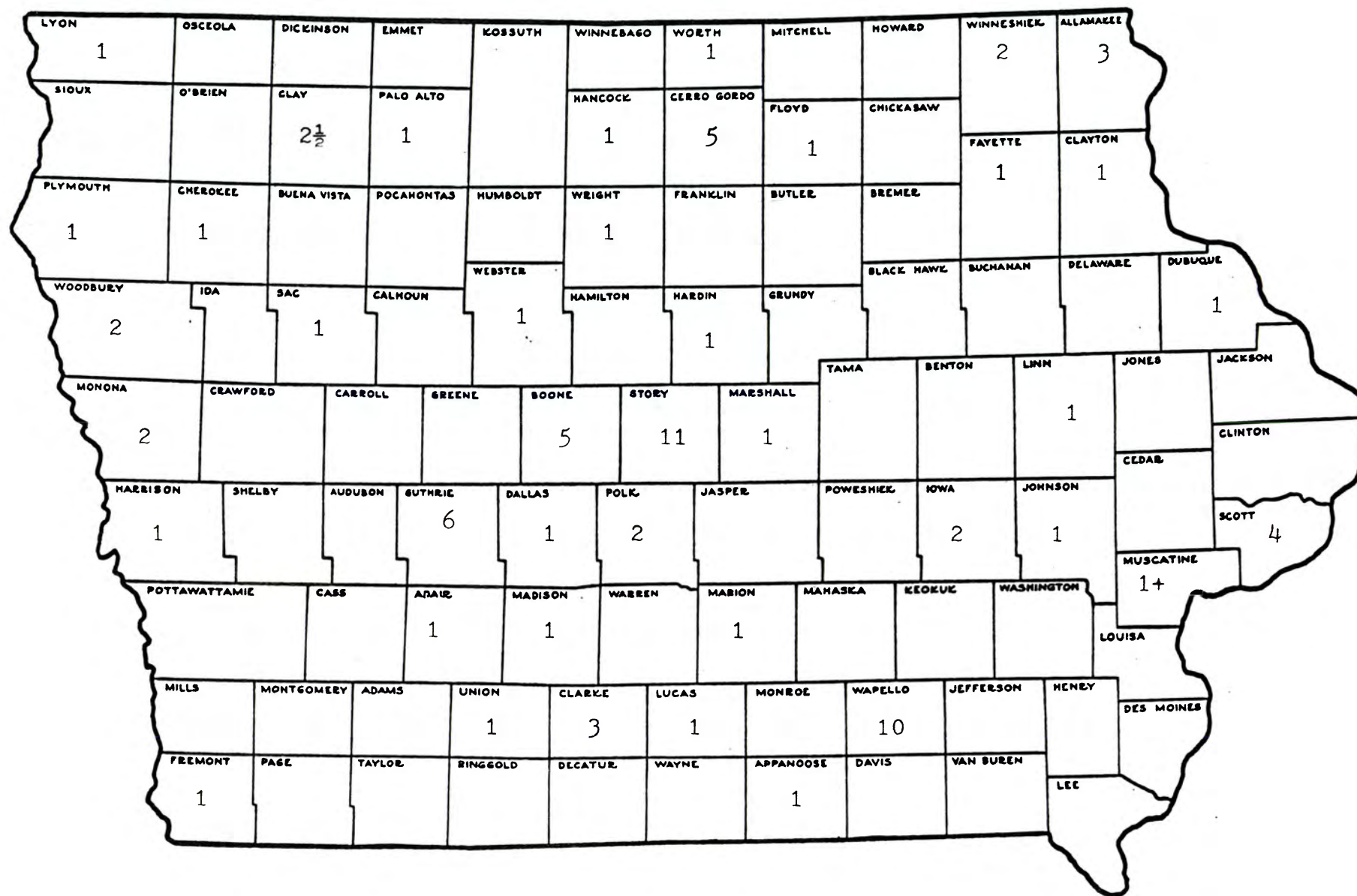
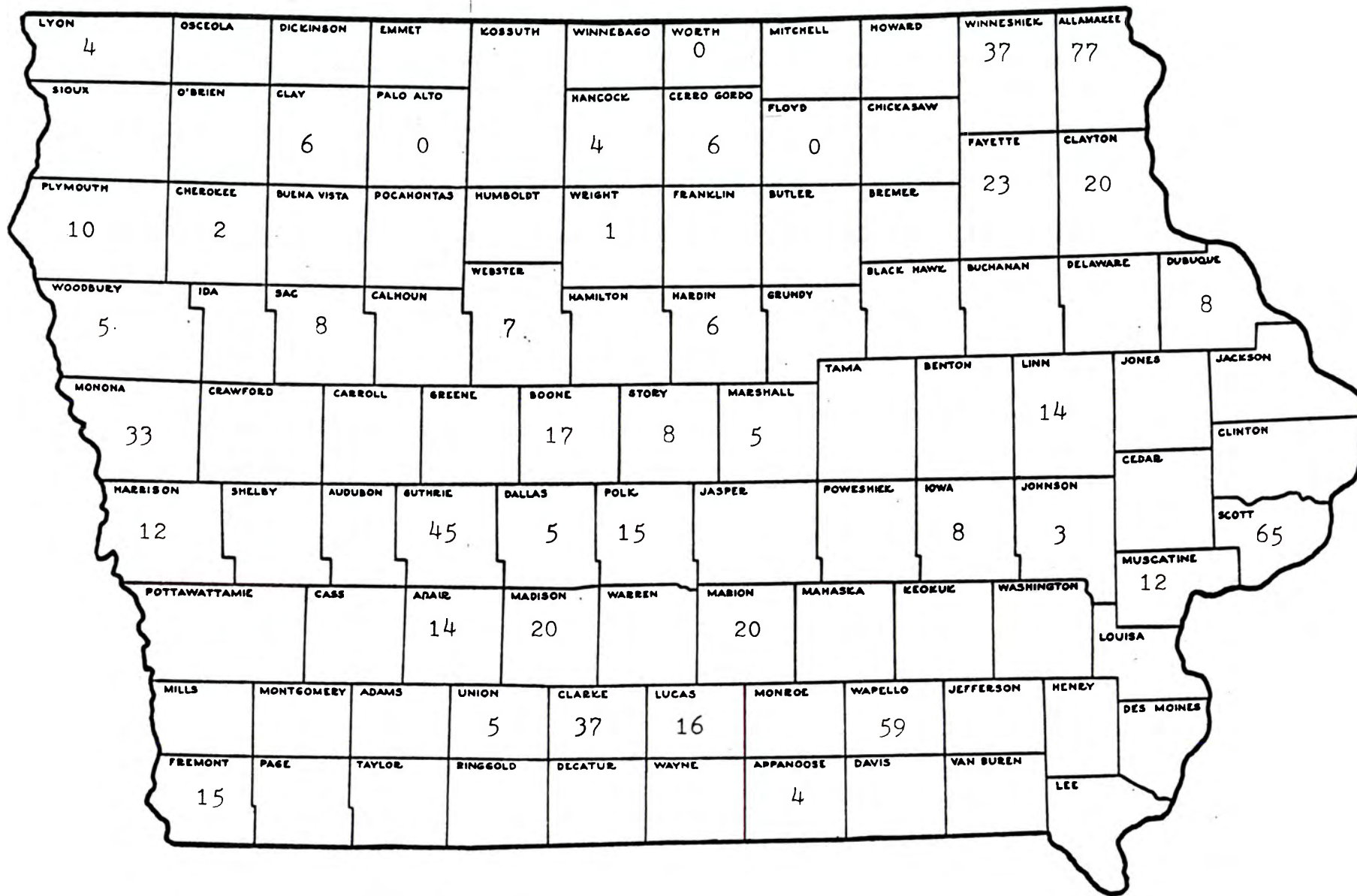


Figure 2 Total No. of Raptors per County



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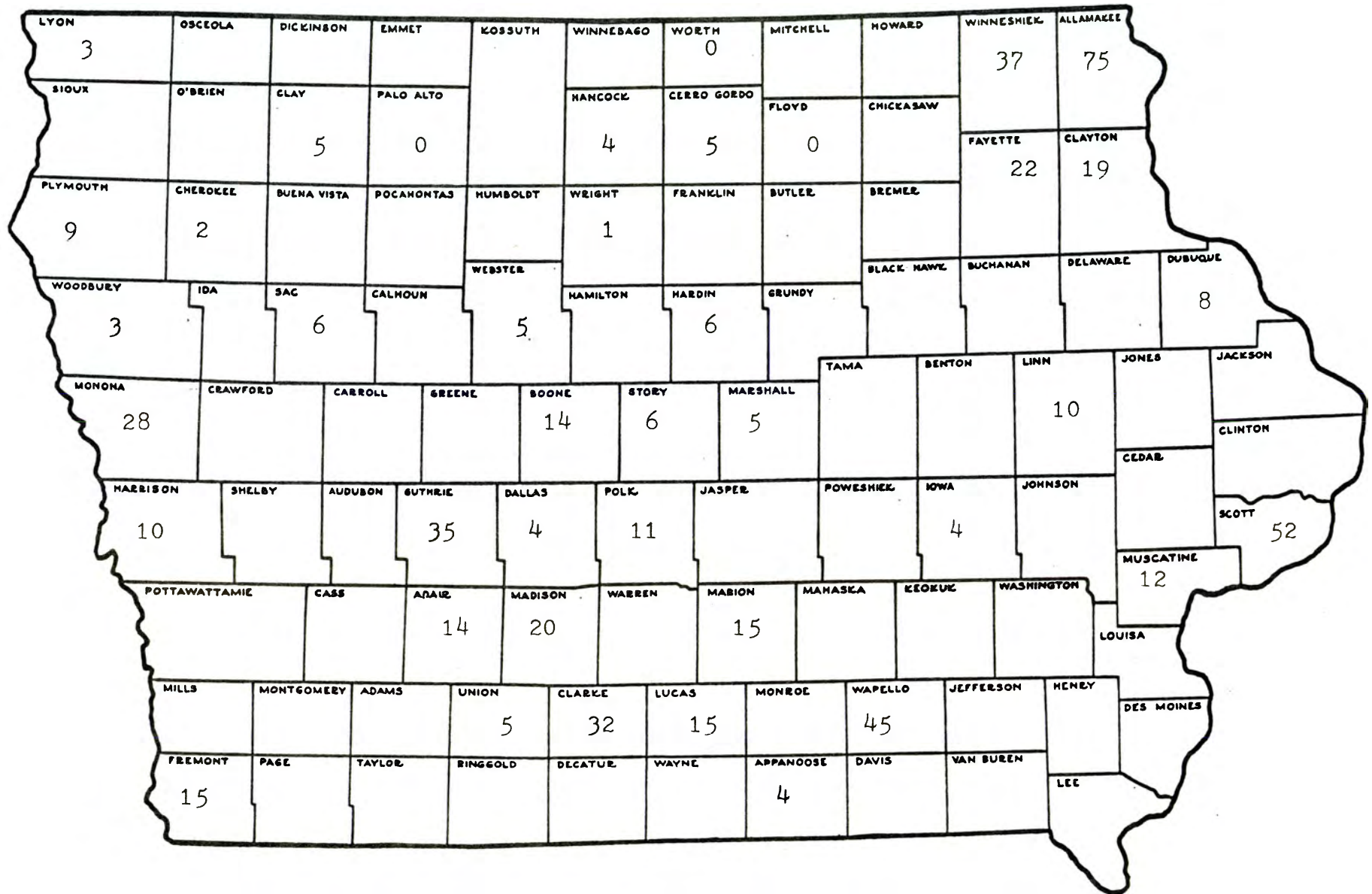
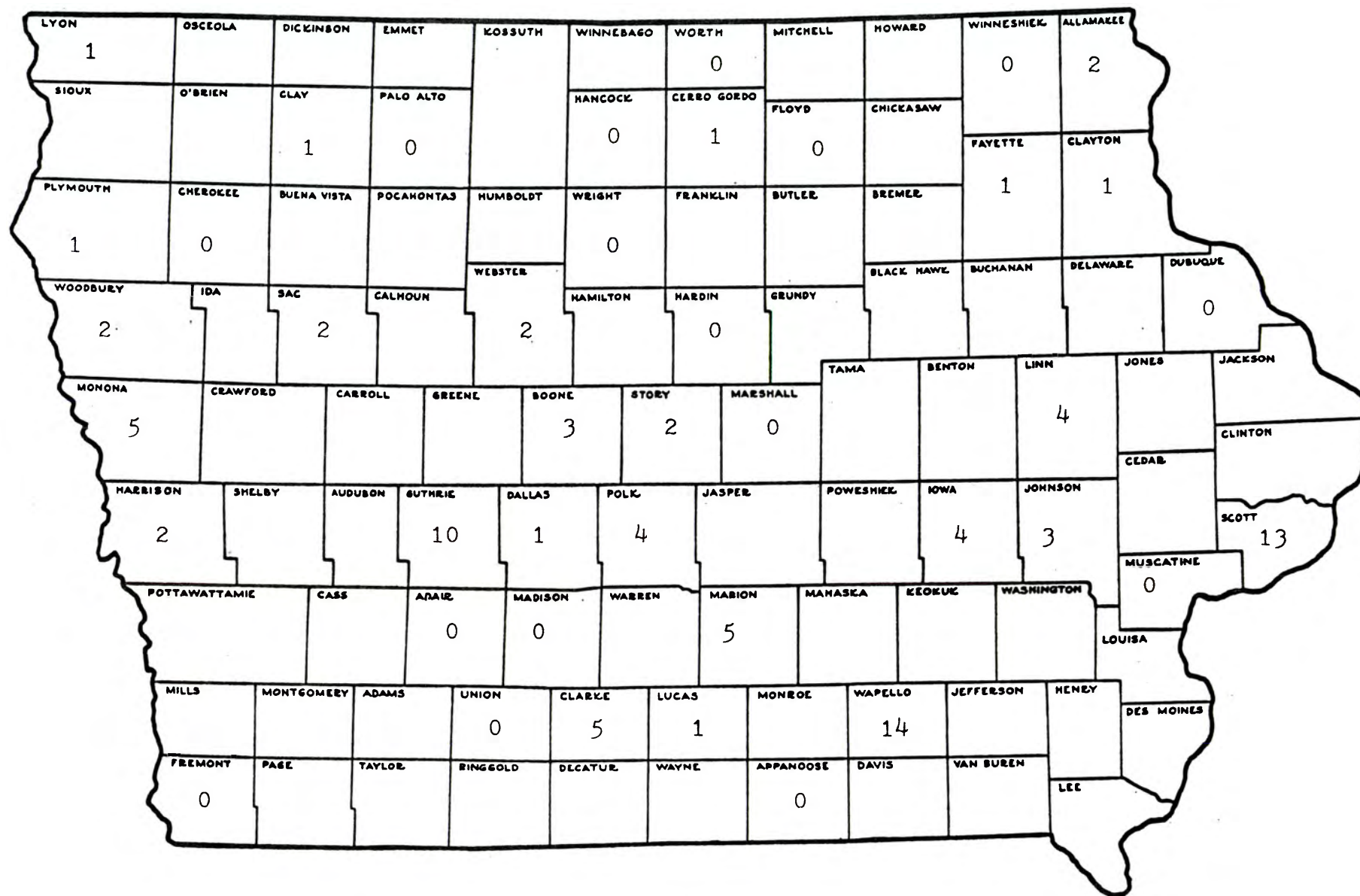


Figure 4 No. of Owls per County



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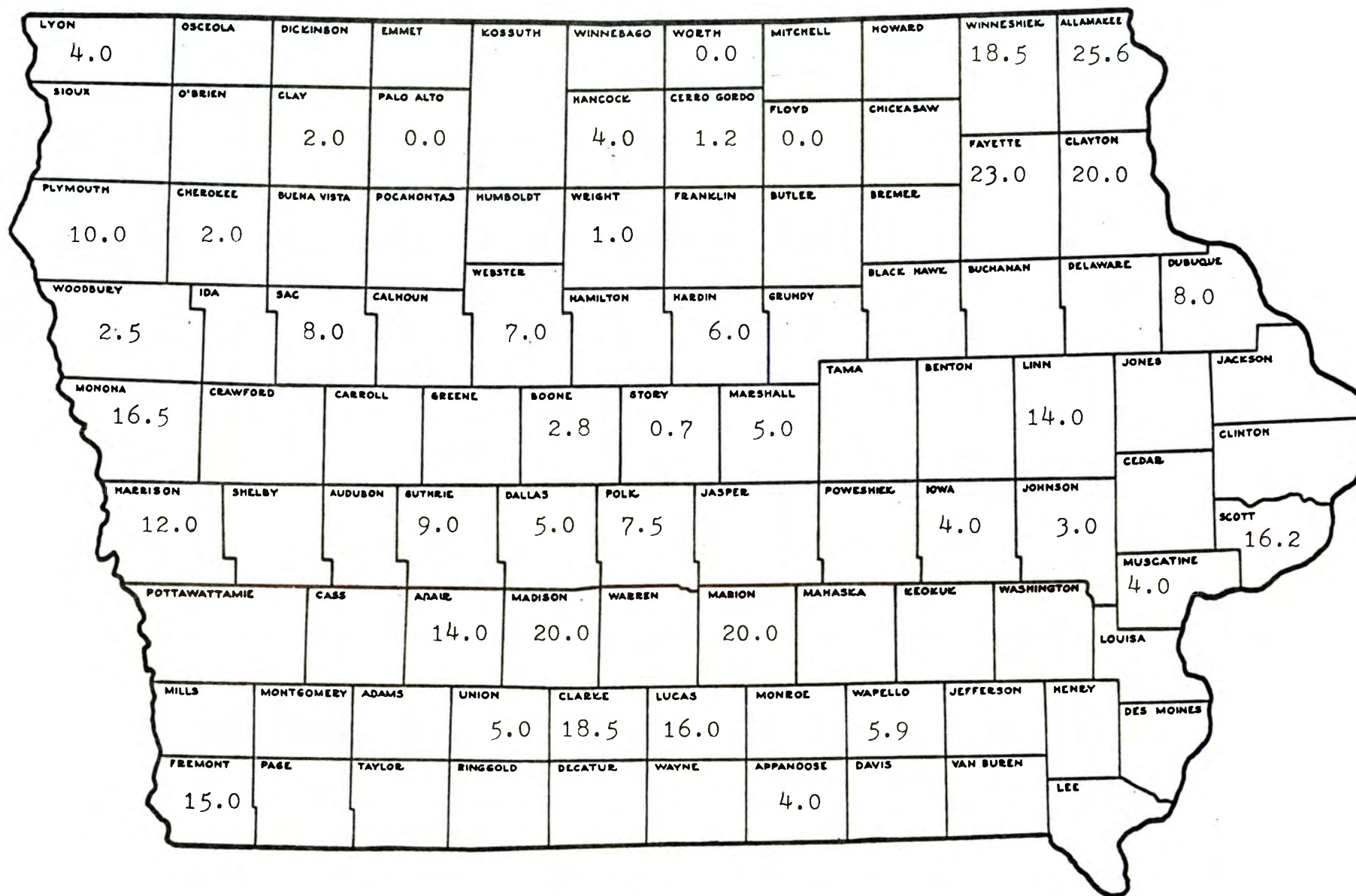


Table 4
Habitat Utilized by, Activity, Sex and Age
of Winter Raptors in Iowa

Species	Habitat Type ¹						of Winter Raptors in Iowa			Activity ²			Age		Sex	
	1a	1b	2	3	4a	4b	5	6	7	1	2	3	Ad	Im	M	F
Goshawk					1		1			2						
Sharp-shinned				1	2		3			2	3	1				
Cooper's		1					1			1		1	2		1	
Red-tailed	4	23	35	18	52	29	179	2	4	258	79	6	224	24	23	23
Rough-legged	9	12	25	5	5	4	31	1		53	30	5	24			
Buteo, sp.				1		1	3			2	3					
Golden Eagle							1				1		1			
Bald Eagle	3		3		4	17	3	29		32	25	2	38	25		
N. Harrier						1		1	1	1	2		1		2	
Merlin	1						1			1	1		2		1	1
Am. Kestrel	8	18	12	8		1	8		9	44	14	2	20		31	13
Barn Owl			1							1						
Screech Owl			1	3	3		1		3	11	1		1			
G.H. Owl		1	2	9	6	6	12		4	34	5		16		2	3
Barred Owl				1	3	2	1			5	1	1	1			
L.E. Owl				1	1		3	1		3		3	1			
S.E. Owl	1	10	2							5	7	1	1			
Saw-whet Owl					1					1						
Owl, Sp.					8						8					
Total Hawks	25	54	75	33	64	53	231	33	14	396	158	17	312	49	58	37
Total Owls	1	11	6	14	22	8	17	1	7	60	22	5	20		2	3

¹Habitat types--(1a) cultivated field, plowed; (1b) cultivated field, unplowed; (2) pasture; (3) windbreak; (4a) wooded, upland; (4b) wooded, river bottom; (5) edge; (6) marsh or open water;

(7) miscellaneous, e.g., urban, buildings, etc.
²Activity--(1) perched; (2) flying; (3) pursuing prey

Table 5
Percentage of Habitat Types and the Number of
Raptors Found in 9 Selected Townships

Raptors	Habitat Types (%)								
	1a (36)	1b (29)	2 (14)	3 (2)	4a (7)	4b (7)	5 (1)	6 (2)	7 (2)
Red-tailed Hawk	0	11	11	3	2	7	11	2	0
Rough-legged Hawk	0	2	3	1	0	0	1	0	0
Buteo, sp.	0	0	0	0	0	1	0	0	0
Bald Eagle	0	0	0	0	0	1	0	0	0
Merlin	0	0	0	0	0	0	1	0	0
Am. Kestrel	0	3	1	3	0	0	0	0	0
Screech Owl	0	0	0	0	0	0	1	0	0
Great Horned Owl	0	0	0	2	0	3	4	0	2
Total Raptors (%)	0 (0)	6 (9)	15 (23)	9 (14)	2 (3)	12 (18)	18 (27)	2 (3)	2 (3)

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.

Following are results of the survey conducted January 1-10, 1978.

Adult Eagles	Immature Eagles	Unidentified	Total
85	23	42	150

	Goshawk	Sharp-shinned	Cooper's	Red-tailed	Rough-legged	Buteo, sp.	Golden Eagle	Bald Eagle	N. Harrier	Merlin	Am. Kestrel	Barn Owl	Screech Owl	G.H. Owl	Barred Owl	L.E. Owl	S.E. Owl	Saw-whet Owl	Cwl, sp.	Total	No. Townships Surveyed	Raptors/Twp
<u>Biogeographical Regions</u>																						
Sioux Quartzite Region	0	0	0	3	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	4	1	4.0
Paleozoic Plateau Region	1	1	1	115	15	0	1	13	0	0	6	0	0	1	2	0	1	0	0	157	7	22.4
Driftless Ridge & Valley Sect	1	1	1	77	11	0	1	13	0	0	3	0	0	1	2	0	0	0	0	111	5	
Turkey River Hill Section	0	0	0	38	4	0	0	0	0	0	3	0	0	0	0	0	1	0	0	46	2	
Kansan Drift Region	1	1	0	120	49	2	0	32	0	0	32	1	8	17	3	0	8	0	0	285	32	8.0
East. Tabular Uplands Section	0	0	0	3	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	8	1	
Tabular Uplands Section	0	0	0	22	9	2	0	29	0	0	11	0	6	10	2	0	2	0	0	94	11	
Rolling Hills Section	1	1	0	95	35	0	0	3	0	0	21	1	1	7	1	0	5	0	10	181	19	
West. Rolling Hills Section	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0	2	1	
Iowan Surface Region	0	1	0	16	2	1	0	0	0	0	0	0	0	1	1	3	0	0	0	25	7	3.5
Swell and Swale Section	0	0	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	1	
Northern Swell and Swale Sect	0	0	0	4	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	6	5	
Paha Ridge Section	0	1	0	7	1	1	0	0	0	0	0	0	0	0	1	3	0	0	0	14	1	
Northwest Iowa Plains Region	0	0	0	5	1	0	0	0	1	0	0	0	0	0	0	0	1	0	0	8	3 $\frac{1}{2}$	2.2
Western Plains Section	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	2	1	
Tazewell Swell & Swale Section	0	0	0	5	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	6	2 $\frac{1}{2}$	
Loess Bluffs Region	0	2	0	23	3	0	0	0	0	0	9	0	1	3	0	1	0	1	0	43	3	14.3
Wisconsin Surface Region	0	0	1	44	17	1	0	0	1	1	15	0	3	14	1	0	6	0	0	104	31	3.3
Alluvium Region	0	0	0	18	1	0	0	5	0	1	3	0	0	2	0	0	0	0	0	30	3	10.0
Missouri River Section	0	0	1	18	1	0	0	5	0	1	3	0	0	2	0	0	0	0	0	30	3	

Table 6
Raptors Reported from Various Biogeographical Areas of Iowa

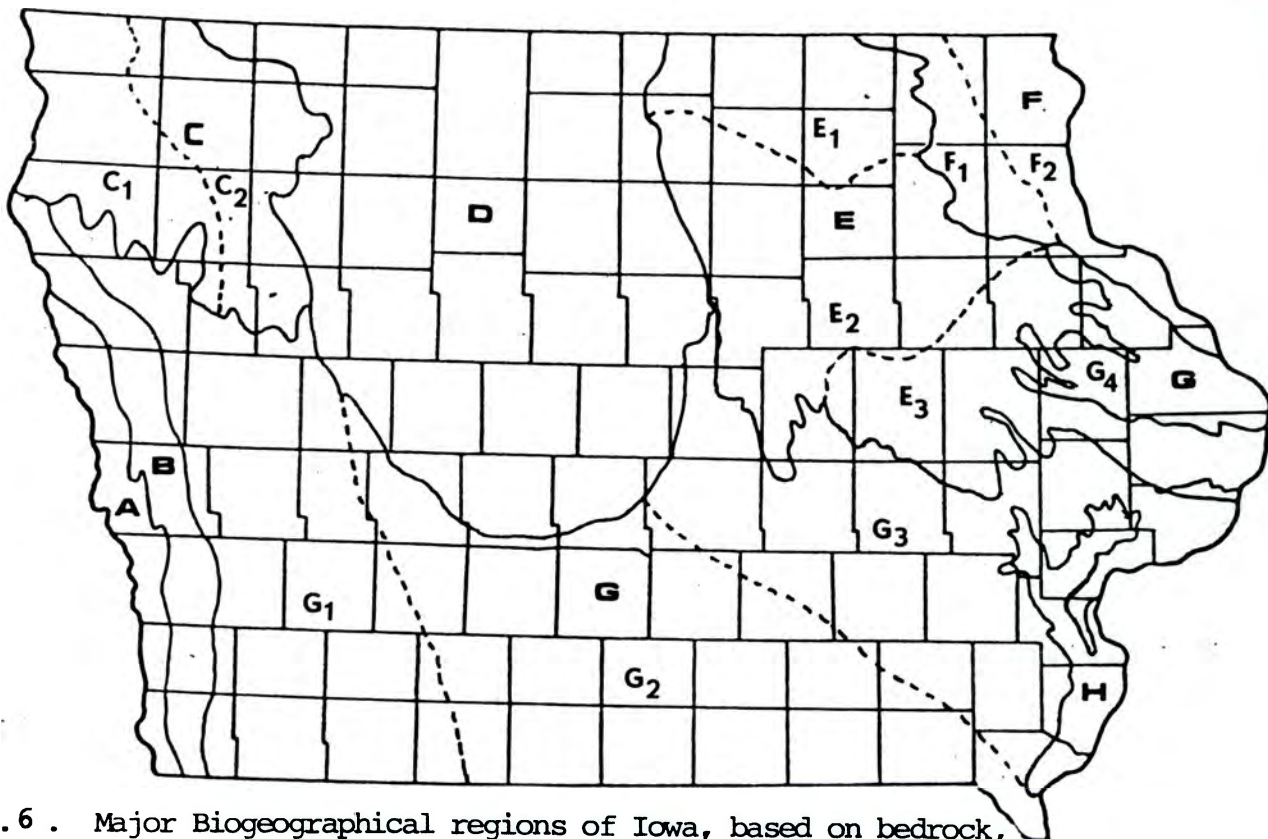


Fig. 6 . Major Biogeographical regions of Iowa, based on bedrock, soils, climate, topography and distribution of biota.

Biogeographical Regions of Iowa.

- A. Missouri River Alluvium region
- B. Loess Hills Region
- C. Northwest Iowa Plains Region
 - C₁ Western Iowa Plains Section
 - C₂ Tazewell Swell and Swale Section
- D. Wisconsin Surface Region
- E. Iowan Surface Region
 - E₁. Northern Swell and Swale section
 - E₂. Swell and Swale section
 - E₃. Paha Ridge Section
- F. Paleozoic Plateau Region
 - F₁. Turkey River Section
 - F₂. Driftless Ridge & Valley Section
- G. Kansan Drift Plain
 - G₁. Western Rolling Hills Section
 - G₂. Rolling Hills Section
 - G₃. Tabular Uplands Section
 - G₄. Eastern Tabular Uplands Section
- H. Lake Calvin Region

HABITAT

1. cultivated field
 - a. plowed
 - b. unplowed
2. pasture (grassy area)
3. windbreak or scattered trees
4. wooded
 - a. upland
 - b. river bottom or bank or lake
5. edge (e.g., pasture/woods; mixed field/woods; etc.)
6. marsh or open water
7. miscellaneous, specify, e.g., urban, buildings, etc.

ACTIVITY

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

TIME

expressed as, e.g.,
0700-1300

TEMPERATURE

specify either F or C

DIVERSITY INDEX

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

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:

Miles Travelled:

Date:

Time:

Observers:

Weather

Wind (mph):

Clouds:

Temperature:

(Precipitation):

Direction:

[illegible]

Direction:

[illegible]