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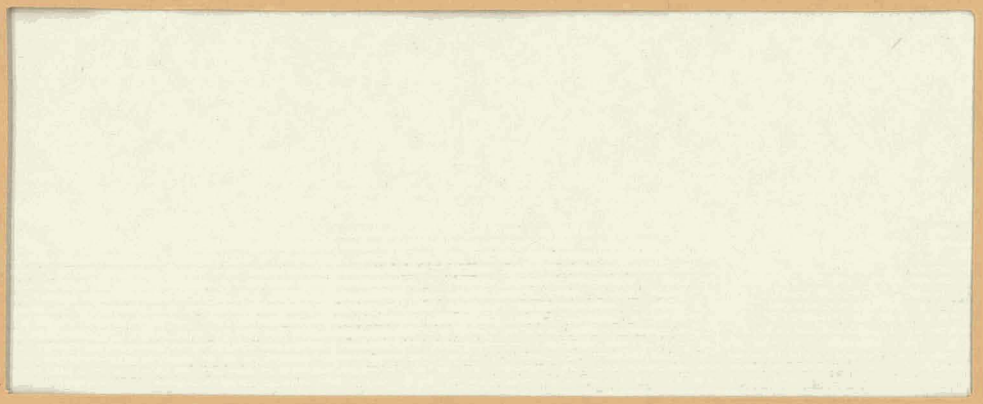

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ARGONNE NATIONAL LABORATORY

Energy and Environmental Systems Division

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U. S. DEPARTMENT OF ENERGY
Assistant Secretary for Environment
Office of Technology Impacts
Regional Assessments Division

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THREATENED AND ENDANGERED FISH AND WILDLIFE OF THE MIDWEST

by

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Integrated Assessments and Policy Evaluations Group
Energy and Environmental Systems Division

June 1980

prepared for

U.S. DEPARTMENT OF ENERGY
Assistant Secretary for Environment
Office of Technology Impacts
Regional Assessments Division

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1 INTRODUCTION

This report contains information on federally-listed endangered and/or threatened fish and wildlife occurring in the midwestern states of Illinois, Indiana, Iowa, Kansas, Michigan, Minnesota, Missouri, Nebraska, Ohio, and Wisconsin. These states (EPA regions V and VII) are the focus of Argonne National Laboratory's Regional Assessments Program. The information was compiled as a support document for the Regional Issue Identification and Assessment (RIIA) project sponsored by the Regional Assessments Division of the Office of Technology Impacts within the Department of Energy. RIIA and similar projects provide regional information to federal decision-makers regarding potential environmental and socioeconomic impacts of alternative federal energy policies. The information on midwestern endangered species distribution, habitats, and reasons for population decline included in this document are designed to help assess the potential for adverse impacts if energy activities are sited within the general range of an endangered species. It is hoped that this document will thereby enhance the reliability of one portion of energy-related assessments performed in the Midwest.

This report considers only those species listed prior to October 1979 as endangered and/or threatened in the federal endangered species list published in the Federal Register and that have been known to occur in the region in the last 20 years (Table 1). State lists, which include species considered to be endangered within each of these ten states, though not necessarily within the nation, are reproduced in Appendix A. The text for each federally listed endangered species contains a description of the status of the species, its former and present distribution, important habitat characteristics, reasons for its decline, and management plans for preserving the species. Maps and literature sources are also included.

To arbitrarily differentiate between present and historic distribution, all species that have not been sighted within the study area since 1959 were deleted on the assumption that they have been extirpated. The distribution information for each species is mapped and documented, with the date of sighting recorded, if known. It must be remembered that animals do not recognize man-made boundaries such as those between states and counties, but are limited by the extent of the habitat in which they are found. The distribution of endangered wildlife is especially difficult to define, as observations are scarce and reliability is constantly in question. Therefore, although great effort was made to describe the distribution of each species as accurately as possible, some errors may be expected.

The remainder of the text for each species was compiled to familiarize nonbiologists with the needs and vulnerabilities of each organism. These summaries were purposely kept brief, emphasizing factors that would help determine the organism's response to environmental changes brought about by energy development. Each summary is supported by an in-depth literature search utilizing books, journals, technical reports, conference proceedings, numerous unpublished works, and wildlife experts (listed in Appendix B) as information sources.

Table 1. Federally Listed Endangered and Threatened Fish and Wildlife Reported to Occur in the Midwest

MAMMALS	
Black-footed Ferret	*Mustela nigripes*
Eastern Cougar	*Felis concolor cougar*
Gray Bat	*Myotis grisescens*
Gray Wolf	*Canis lupus*
Indiana Bat	*Myotis sodalis*
Northern Swift Fox	*Vulpes velox hebes*
BIRDS	
American Peregrine Falcon	*Falco peregrinus anatum*
Arctic Peregrine Falcon	*Falco peregrinus tundrius*
Bald Eagle	*Haliaeetus leucocephalus*
Eskimo Curlew	*Numenius borealis*
Kirtland's Warbler	*Dendroica kirtlandii*
Whooping Crane	*Grus americana*
FISH	
Blue Pike	*Stizostedion vitreum glaucum*
Longjaw Cisco	*Coregonus alpenae*
MOLLUSKS	
Iowa Pleistocene Snail	*Discus macclintocki*
Curtis' Pearly Mussel	*Epioblasma (Dysnomia) florentina curtisi*
Fat Pocketbook Pearly Mussel	*Potamilus (Proptera) capax*
Higgin's Eye Pearly Mussel	*Lampsilis higginsi*
Orange-Footed Pimpleback Pearly Mussel	*Plethobasis cooperianus*
Pink Mucket Pearly Mussel	*Lampsilis orbiculata orbiculata*
Sampson's Pearly Mussel	*Epioblasma (Dysnomia) sampsoni*
Tubercled-Blossom Pearly Mussel	*Epioblasma (Dysnomia) torulosa torulosa*
White Cat's Paw Pearly Mussel	*Epioblasma (Dysnomia) sulcata delicata*

2 SPECIES DESCRIPTIONS

2.1 MAMMALS

2.1.1 Black-Footed Ferret (*Mustela nigripes*)

Status

The black-footed ferret is listed as endangered (U.S. Fish and Wildlife Service, 1979). Very few observations have been confirmed within recent years. In fact, this animal has been referred to as the rarest mammal on the North American continent (Gates, 1973).

Former Distribution

The original range extended from Alberta to Saskatchewan to Texas, New Mexico, and Arizona (Hall and Kelson, 1959).

Present Distribution

Recent confirmed sightings reveal the black-footed ferret clinging to survival in very limited numbers throughout most of its former range (Linder and Hillman, 1973). Although no confirmed sightings have been made in the Midwest, the species is included on the basis of a number of probable sightings in Kansas and Nebraska.

Habitat

These nocturnal animals are found in short and mid-grass prairies, existing in close relationship with prairie dogs (*Cynomys spp.*) (Henderson et al., 1969). In addition to utilizing the prairie dog burrows for shelter, they rely on the small rodents as a food source. For example, Sheets et al. (1972) report that 91% of the ferret's diet is composed of prairie dogs.

Reasons for Decline

Control of the prairie dog as a pest species has been responsible for the decline in ferret numbers. Widespread use of strychnine, sodium monofluoroacetate, and other poisons reduced the food supply and also caused secondary poisoning to these predators (Hillman, 1968). Other likely causes of decline include destruction of natural grasslands, elimination of den holes, roadkills, shooting, trapping, and possibly disease (BFFRT, 1978; Bureau of Sport Fisheries and Wildlife, 1973).

Management Plans

Due to the ferret's dependency on prairie dogs, any management programs aimed at the small rodents would favor the ferret. Henderson et al. (1969) list 10 management proposals to save this endangered species. Included are: 1) develop materials for prairie dog and other animal control that will not poison ferrets; 2) explore all feasible means of retaining adequate numbers of prairie dogs and ferrets on both public and private lands; and 3) experiment with transplanting and releasing ferrets into areas where prairie dogs are protected.

In interviews with South Dakota ranchers, Linder et al. (1972) found that a small percentage of them were against having any prairie dogs while the majority stated that they would like to have prairie dog towns only if they could be kept from becoming too large. Preliminary work by a graduate student indicates that such prairie dog control may be feasible through the use of reproductive inhibitors (Pfeiffer, 1972). However, further research is needed in this regard.

Ferret transplanting and reintroduction programs also seem feasible. Goodwin and Holloway (1972) advise that any animal captured on private land be released on public lands that have adequate prairie dog populations. Such actions have been taken in South Dakota at Wind Cave National Park and in Wyoming at Devil's Tower National Monument.

The Patuxent Wildlife Research Center in Maryland is also ready for a captive-breeding program should any animals be brought in. Biologists at the Center have been working with two races of Siberian ferrets (close relatives of the black-footed ferret) since 1975 and have had great success in breeding them in captivity (Sayre, 1979).

Table 2. Black-Footed Ferret (*Mustela nigripes*) Distribution in the Midwest

State	Counties	Sighting Date	Source
Illinois			
Indiana			
Iowa			
Kansas	Barton, Cheyenne, Clark Ellis, Finney, Gove, Grant, Gray, Hamilton, Kingman, Kiowa, Lane, Logan, Meade, Morton, Ness, Norton, Pratt, Rawlins, Saline, Seward, Stanton, Stevens, Trego, Wallace, Wichita	1968-1973[a]	6
Michigan			
Minnesota			
Missouri			
Nebraska	(Although no counties have been mentioned, numerous probable sightings have been reported from the south central and panhandle portions of the state).		11
Ohio			
Wisconsin			

[a]These are probable sightings, which are defined as those not verified by a state or federal biologist or other qualified personnel.

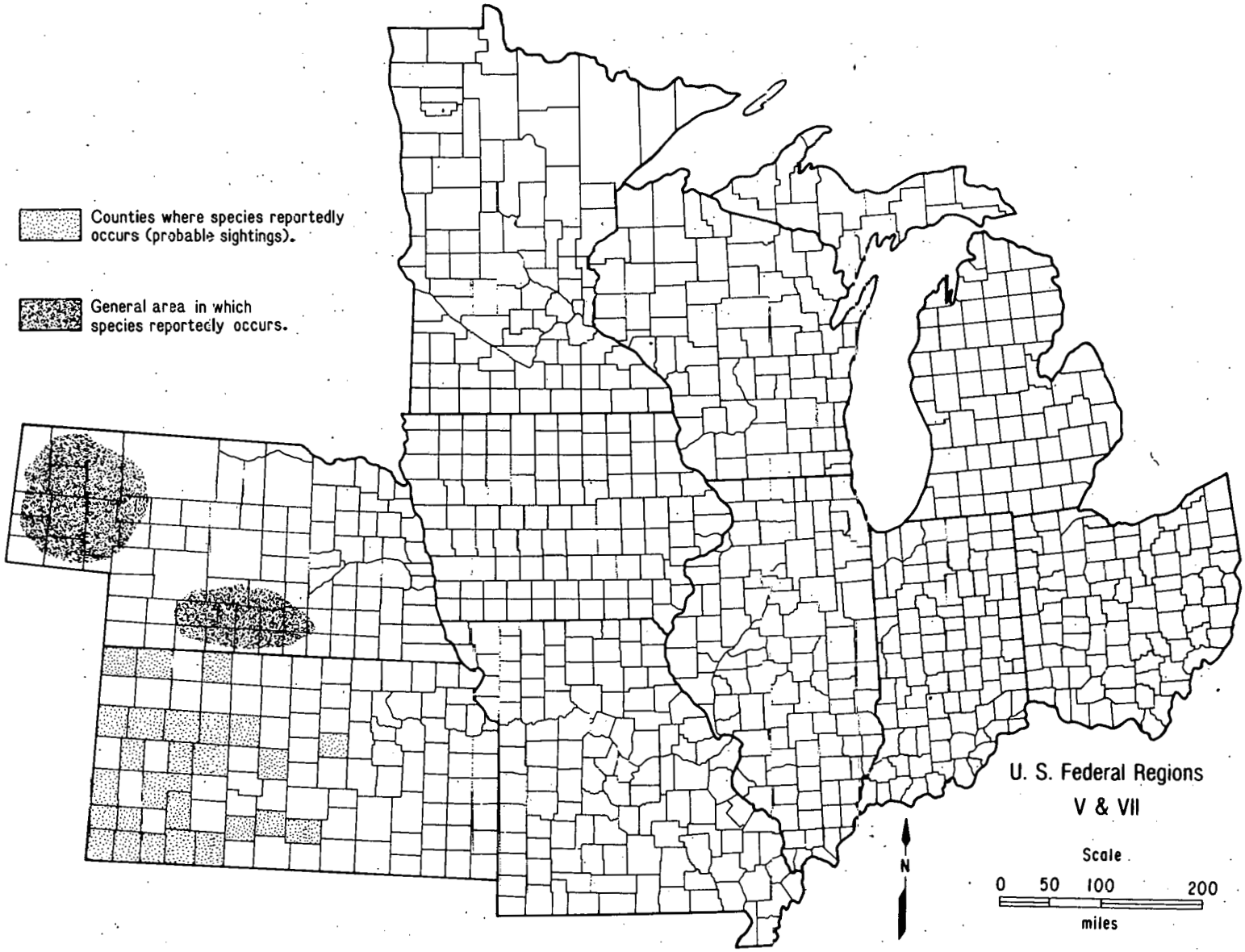

Fig. 1. Black-Footed Ferret Distribution in the Midwest

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2.1.2 Eastern Cougar *(Felis concolor cougar)*

Status

The eastern cougar is listed as endangered (U.S. Fish and Wildlife Service, 1979). It was formerly regarded as extinct, but numerous sightings have been reported in recent years (Bureau of Sport Fisheries and Wildlife, 1973). It is believed that with the increase in deer populations the cougar is reoccupying parts of its former range (Wright, 1971).

Former Distribution

The eastern cougar was originally found throughout North America east of the Great Plains except in the extreme Southeast, where its distribution merged into that of the Florida panther (*F. c. coryi*) (Goodwin and Holloway, 1972; Bureau of Sport Fisheries and Wildlife, 1973).

Present Distribution

The present range of the eastern cougar is unclear. Scattered evidence reveals that this cat occurs in Louisiana, Arkansas, Oklahoma, Missouri and from eastern Canada to the Carolinas (Lewis, 1969; Bureau of Sport Fisheries and Wildlife, 1973). In the Midwest, it is found only in southern Missouri (see map).

Habitat

No specific habitat is required, although the cougar appears to prefer large, densely-vegetated areas supporting adequate food supplies, primarily deer (Wright, 1972).

Reasons for Decline

Populations of the once-common eastern cougar were drastically eliminated in the late 1800s by hunting and trapping. Destruction of habitat, human inhabitation and a decline (until recently)in its principal prey species, the white-tailed deer *(Odocoileus virginianus)*, have also contributed to its endangerment (Goodwin and Holloway, 1972; Bureau of Sport Fisheries and Wildlife, 1973).

Management Plans

Besides complete protection from hunting, further management is not known.

Table 3. Eastern Cougar (*Felis concolor cougar*) Distribution in the Midwest

State	Counties	Sighting Date	Source
Illinois			
Indiana			
Iowa			
Kansas			
Michigan			
Minnesota			
Missouri	Howell	1966	3
Nebraska			
Ohio			
Wisconsin			

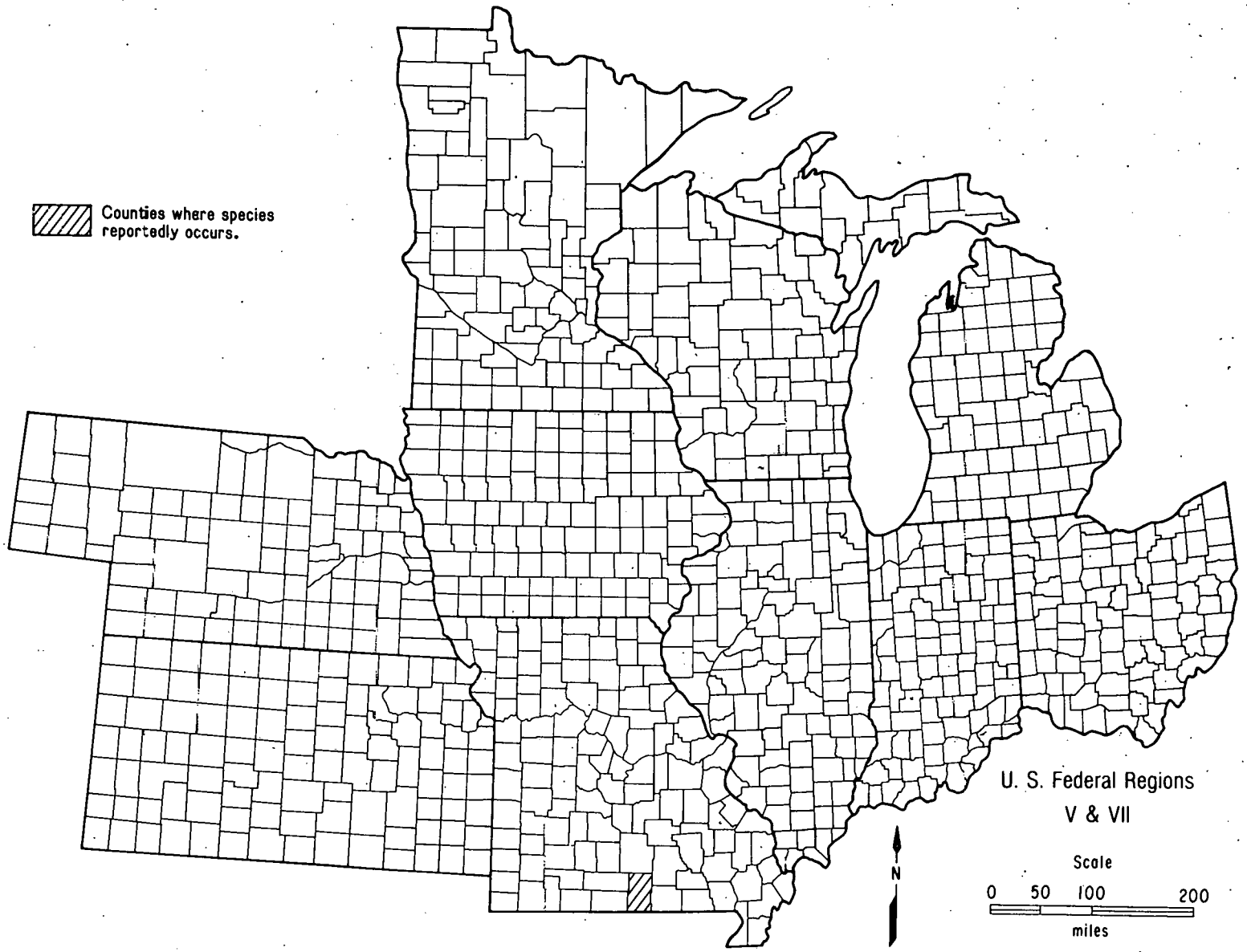

Fig. 2. Eastern Cougar Distribution in the Midwest

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2.1.3 Gray Bat *(Myotis grisescens)*

Status

This species is listed as endangered (U.S. Fish and Wildlife Service, 1979). The population is quite large (estimated to be about 2.25 million in 1970). However, there is evidence of drastic population reductions (U.S. Fish and Wildlife Service, 1977). This species is classified as endangered because of its vulnerability and limited habitat: it is estimated that 9 caves contain over 95% of the total population during winter (U.S. Fish and Wildlife Service, 1977).

Former Distribution

M. grisescens was formerly found throughout the southeastern United States.

Present Distribution

Although still found within its former range, fragmentation and isolation of the population are increasing.

Habitat

This species is restricted to limestone caves. Because of narrow habitat restrictions, less than 5% of available caves are suitable for gray bat use at any season and most colonies must migrate seasonally between warm and cold caves (Barbour and Davis, 1969; Hall and Wilson, 1966; Myers, 1964; Tuttle, 1976a; Tuttle and Stevenson, 1977). Most colonies include at least several thousand individuals (U.S. Fish and Wildlife Service, 1977).

Tuttle (1976a) showed a striking correlation between locations of gray bat colonies and major bodies of water where they feed. Summer colonies were usually located in caves within 1 km of a major river or lake and rarely farther than 4 km (Tuttle, 1976b). Maternity cave selection is especially important due to the high energetic demands of travel. As the distance from cave to foraging areas increases, growth and survival rates decrease in the young. Exceptionally warm caves are also energetically ideal in terms of increasing growth rates (Tuttle, 1976b).

At evening emergence, the bats will usually fly to the feeding ground under the protection of a forest canopy. Tuttle (1979) has repeatedly observed *M. grisescens* traveling considerably out of their way to take advantage of a few scattered trees. After reaching the feeding areas, the bats will fly along vegetated edges roughly 3 m above the water surface in search of insects, primarily mayflies (LaVal et al., 1976, 1977; Tuttle, 1976b, 1979).

Hibernacula are characterized by providing mean air temperature cooler by 6°C or more than above-ground mean air temperatures (U.S. Fish and Wildlife Service, 1977). These deep, cold caves function as cold air traps with multiple entrances and good air flow (Tuttle and Stevenson, 1978).

Reasons for Decline

Disturbance by spelunkers (cavers), direct vandalism, cave commercialization, and inundation of caves following construction of dams have greatly contributed to the decline of this mammal (Tuttle, 1977; U.S. Fish and Wildlife Service, 1977). Deforestation and poorly constructed gates near cave entrances, pesticide poisoning, and cave entrance closure have also been detrimental to *M. grisescens* (Tuttle, 1977, 1979).

It has been suggested that chemical pollution and siltation of waterways affects the mayfly, the major food of the gray bat. However, more investigation is needed in this regard (Tuttle, 1979).

It was also initially thought that the increase in reservoirs would benefit the gray bat. Recent studies have shown an opposite conclusion, however. Furthermore, the increased human activity associated with reservoirs would harm these animals. (Tuttle, 1979; Tuttle, Stevenson, and Rabinowitz, in prep.).

Management Plans

Because many remaining populations appear capable of recovery if protected from human disturbance and vandalism, the U.S. Fish and Wildlife Service is both purchasing important caves and fencing and posting other likely areas. Numerous agencies support research and provide protection for the species. Among these are the Division of Forestry, Fisheries and Wildlife (Tennessee Valley Authority), the Army Corps of Engineers, and numerous state departments (Tuttle, 1979).

Tuttle (1979) includes many recommendations for management. Besides providing appropriate agencies with "locations lists," a cave priority protection system of important habitats should be established to restrict human entry. He also maintains that government officials and landowners be educated on the ecology of this mammal. For example, their potential for pest control is excellent. Gray bats from one particular cave consume more than 900 pounds of insects nightly and over 80 tons annually.

Table 4. Gray Bat (*Myotis grisescens*) Distribution in the Midwest

State	Counties	Sighting Date	Source
Illinois	Alexander, Bond, Brown, Calhoun, Clay, Clinton, Edwards, Fayette, Franklin, Gallatin, Greene, Hamilton, Jackson, Jefferson, Jersey, Johnson, Macoupin, Marion, Massac, Monroe, Montgomery, Morgan, Perry, Pope, Pulaski, Randolph, St. Clair, Saline, Scott, Union, Wabash, Washington, Wayne, White, Williamson		21, 23
	Cass, Sangamon		23
	Hardin, Pike		1, 21, 23
	Lawrence, Richland		21
	Adams		2, 21, 23
	LaSalle		5
	Madison		5, 23
Indiana	Dubois, Floyd, Gibson, Harrison, Knox, Orange, Perry, Pike, Posey, Spencer, Vanderburgh, Washington, Warrick		21, 23
	Clark, Daviess, Jackson, Jefferson, Martin, Scott, Switzerland		21
	Lawrence, Jennings	1959-1971	21, 24
	Crawford	1962-1974	21, 23, 24
Iowa			
Kansas	Bourbon, Chautauqua, Cherokee, Cowley, Elk, Harper, Labette, Montgomery, Neosho, Sumner, Wilson		23
	Barber		5, 23
	Crawford	1962-1964	5, 20, 23
Michigan			
Minnesota			

Table 4. (Cont'd)

State	Counties	Sighting Date	Source
Missouri	Audrain, Barton, Bollinger Butler, Callaway, Cedar, Cooper, Howell,. Lincoln, Madison, Marion, Monroe, Montgomery, Newton, Osage, Pettis, Polk, Randolph, St. Charles, Ste. Genevieve, St. Louis, St. Louis City, Saline, Warren, Wayne, Webster		23
	Carter, Cole, Dade, Dallas, Douglas, Casconade, Howard, Jasper, Jefferson, Perry, Reynolds, Ripley, St. Francois, Texas		11, 23
	Crawford, Hickory, Iron, Lawrence, Maries, Miller, Oregon, Phelps, Pike, Pulaoki, Ralls, Washington, Wright		11, 13, 23
	Benton, Boone, Camden, Christian, Greene, Laclede, McDonald, Morgan, Ozark, Stone, Taney		5, 13, 23
	Dent, Franklin		4, 13, 23
	Barry		5, 23
	Moniteu	1967	5, 6, 23
	St. Clair		13, 23
	Shannon		7, 13, 23
Nebraska			
Ohio			
Wisconsin			

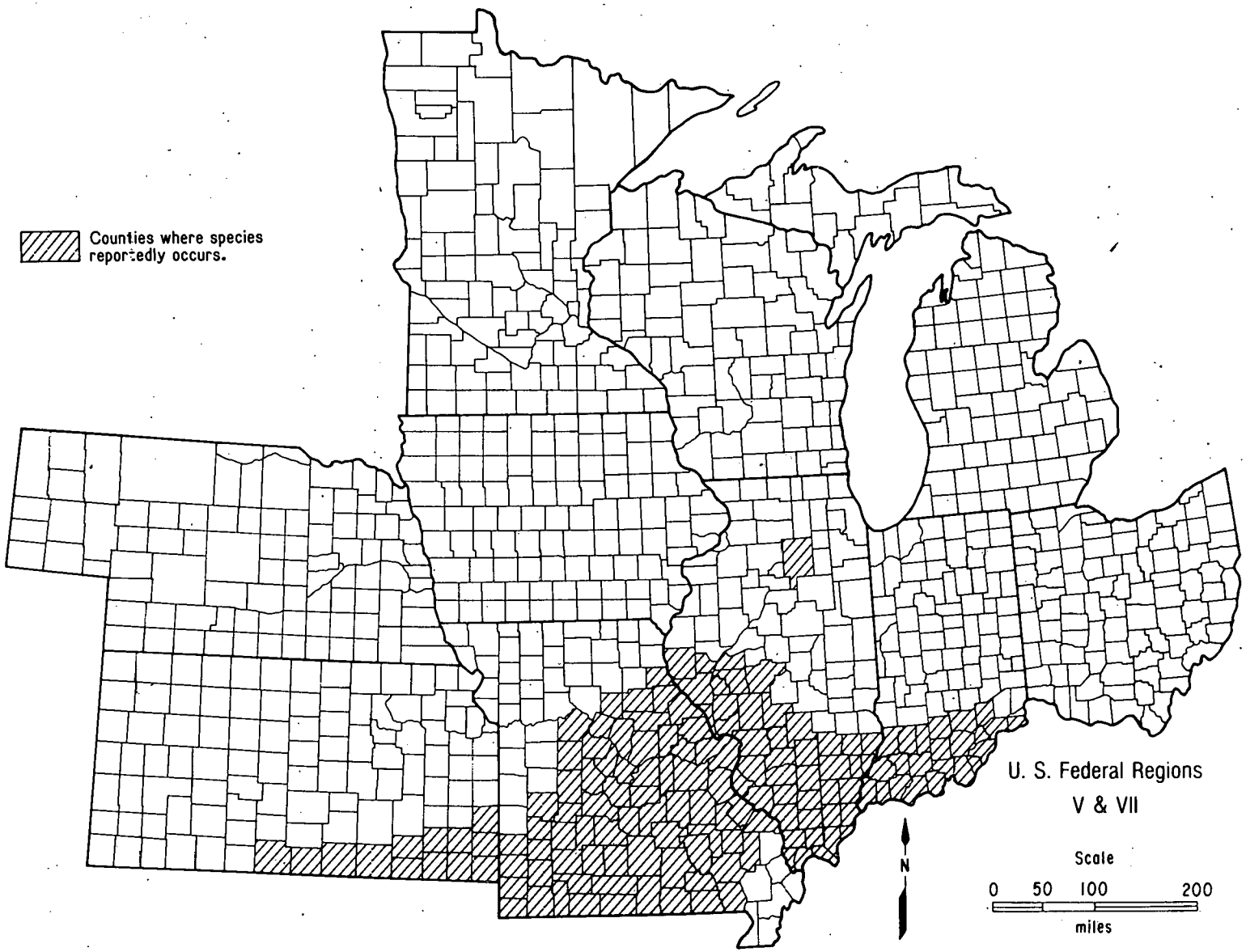

Fig. 3. Gray Bat Distribution in the Midwest

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2.1.4 Gray Wolf *(Canis lupus)*

Status

The gray wolf is listed as endangered within the 48 conterminous states other than Minnesota. It is threatened within Minnesota (U.S. Fish and Wildlife Service, 1979). The 1976 population estimate lists: 1000-1200 in Minnesota; 40 in Isle Royale National Park, Michigan; 6-10 scattered in Michigan and Wisconsin; 10,000-15,000 estimated in Ontario, Canada (U.S. Fish and Wildlife Service, 1977).

Former Distribution

Formerly occurred throughout eastern North America from Hudson Bay south through eastern Manitoba and Minnesota to the Gulf Coast (Mech, 1970).

Present Distribution

Within the contiguous United States, this wolf is found only in the northern portions of Minnesota, Wisconsin, and Michigan. Substantial populations are reported in Ontario, Canada (U.S. Fish and Wildlife Service, 1977).

Habitat

This canid prefers large tracts of wild land with an adequate prey (primarily deer) population. Mech (1974) has shown that territories in the Superior National Forest, Minnesota ranged from 125-310 km^2. Low human densities and minimal accessibility are also critical (ETWRT, 1977). However, Mech (1974) suggests that, given protection, wolves can tolerate human inhabitation.

Reasons for Decline

Intensive human settlement, hunting and trapping for bounties, illegal killing by ranchers, sportsmen and others, and decline in prey populations have contributed to the decline of the wolf (ETWRT, 1977; U.S. Fish and Wildlife Service, 1977).

Management Plans

The ETWRT (1977) suggested three proposals for wolf management: improve habitat for prey species, inform and educate the public, and reintroduce the wolf into areas of low human density.

Additional proposed measures include controlling the taking of wolves by hunting and trapping, establishing sanctuaries, and manipulating wolf habitat (U.S. Fish and Wildlife Service, 1977).

In an effort to reestablish a pack in Michigan, four Minnesota wolves were released in the Upper Peninsula in 1974. Although all four animals were killed by human-related causes, the project demonstrated that wolves can be trans-located (U.S. Fish and Wildlife Service, unpublished). However, in order to be successful, Weise et al. (1975) recommend a strong public education campaign, abatement of all coyote bounties, and release of a larger number of animals.

Table 5. Gray Wolf *(Canis lupus)* Distribution in the Midwest

State	Counties	Sighting Date	Source
Illinois			
Indiana			
Iowa			
Kansas			
Michigan	Chippewa, Iron, Keweenaw, Mackinac, Marquette		4, 8, 10
	Alger, Baraga, Delta, Dickinson, Gogebic, Houghton, Luce, Menominee, Ontonagon, Schoolcraft		4, 8
Minnesota	Aitkin, Beltrami, Cook, Hubbard, Koochiching, Lake, Lake of the Woods, Pine, St. Louis		2, 8, 10
	Carlton, Cass, Clearwater, Itasca, Mahnomen, Marshall, Pennington, Polk, Red Lake, Roseau		8, 10
	Becker, Clay, Crow Wing, Dakota, Norman, Wadena		10
	Kittson		8
Missouri			
Nebraska			
Ohio			
Wisconsin	Barron, Bayfield, Forest, Price, Sawyer, Washburn	1977-1979	3
	Douglas, Florence, Iron, Oneida Vilas		3, 8
	Burnett		8
	Lincoln	1979	7

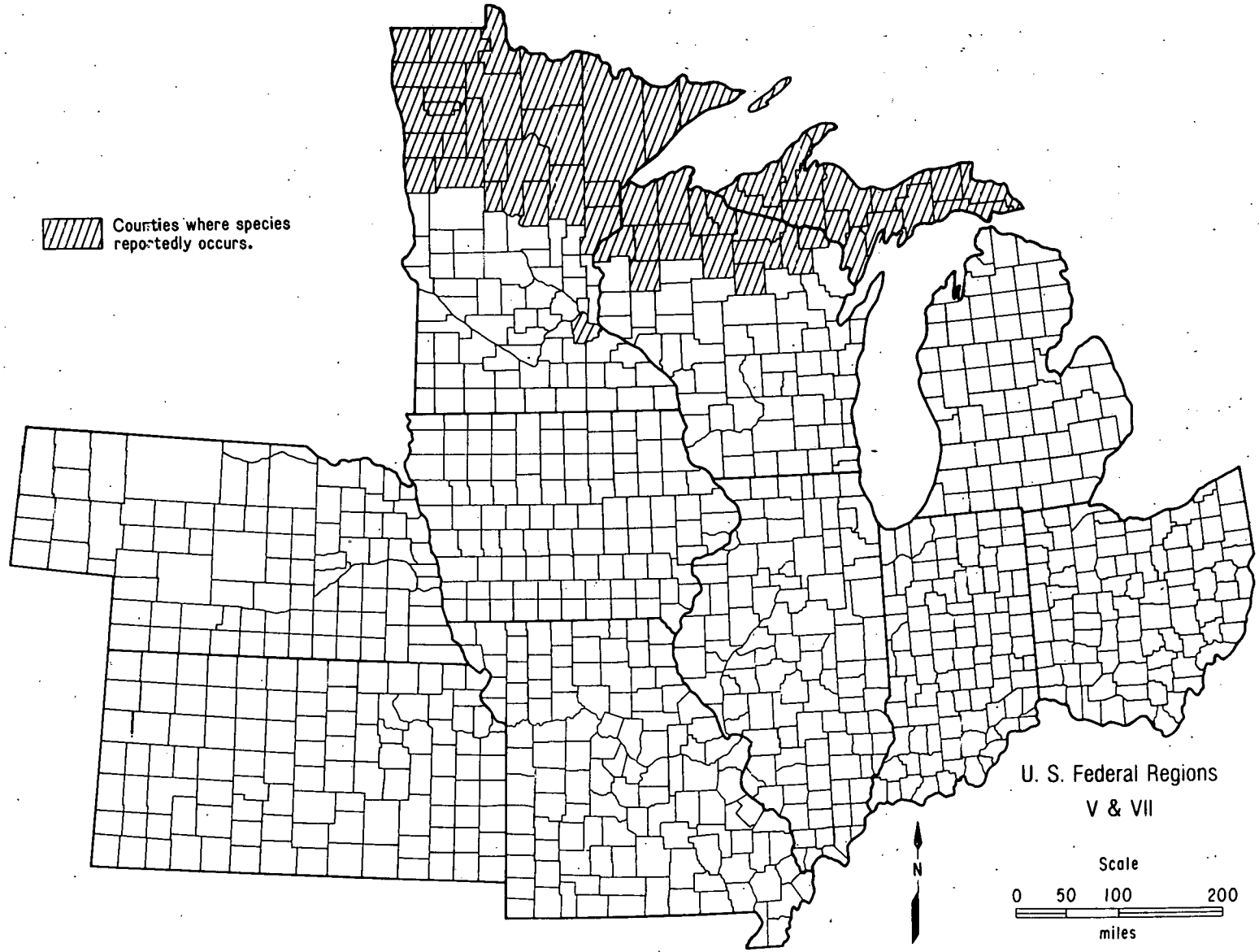

Fig. 4. Gray Wolf Distribution in the Midwest

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2.1.5 Indiana Bat *(Myotis sodalis)*

Status

The Indiana bat is listed as endangered (U.S. Fish and Wildlife Service, 1979). Although the estimated population is 509,000, these bats are vulnerable because approximately 87% of the entire population winters in only seven caves (Richter et al., 1978; Humphrey, 1978). Humphrey (1978) states that the known number of living Indiana bats has declined over 28% in the last 15 years.

Former Distribution

The historic range of the Indiana bat extended from the Ozarks to central Vermont and from southern Wisconsin to northern Florida (U.S. Fish and Wildlife Service, 1977).

Present Distribution

Present range corresponds with the historic range, albeit populations have decreased considerably (U.S. Fish and Wildlife Service, 1977). Humphrey (1978) estimated that more than 85% of the 1975 *M. sodalis* population existed in the Midwest.

Habitat

During winter, male and female *M. sodalis* hibernate together in caves having specific climatic conditions. The temperature ranges between 4-8°C (39.2 - 46.4°F) with 66 - 95% humidity (Allen, 1940; Barbour and Davis, 1969; Humphrey, 1978). According to Hall (1962), these exact conditions are found only in a narrow zone near the mouth of the cave.

Following hibernation, the sexes diverge. Juveniles and females seek out riparian habitats where they roost under the bark of trees. In early summer, they will forage in these lowlands. Later, they will forage away from the water (Humphrey et al., 1977).

Males prefer upland forests and usually roost in caves. Foraging takes place in dense woods at treetop height (LaVal et al., 1976, 1977).

Reasons for Decline

Natural catastrophes (e.g., freezing, flooding, and cave-ins) and collection for laboratory purposes have contributed to the loss of *M. sodalis* (Hall, 1962; Humphrey, 1978; U.S. Fish and Wildlife Service, 1977). Urbanization and deforestation have also adversely affected these bats (Mohr, 1972). Humphrey (1978) concluded that 50% of the decline in recent years is attributable to the destruction or alteration of habitat, resulting in changed air flow patterns and thus unsuitable hibernacula. (Such was the case with

Colossal Cave (Kentucky), where a gate protecting bats from disturbances had altered the microclimate.) The loss of large areas of summer habitat may also be catastrophic to breeding females (Humphrey et al., 1974), although this hypothesis has yet to be proven.

Disturbance from vandals, spelunkers, and biologists has also been an important reason for decline. It has disrupted hibernation and caused deaths and abortions of young (Hall, 1962; Humphrey and Scudder, 1976; IBRT, 1975). Humphrey (1978) stresses the fact that 60,000 bats in one cave were lost because of such disturbance.

Insecticide poisoning may possibly be a new threat, but definite proof is lacking (U.S. Fish and Wildlife Service, 1977).

Management Plans

Research on this species continues. Caves are being protected from disturbance by constructing gates across the entrances, and state agencies, such as the Indiana Department of Natural Resources, are purchasing caves and passing laws to ensure protection of the species (IBRT, 1975). Other efforts include a moratorium on the issuance of bat bands by the U.S. Fish and Wildlife Service and the organization of a Bat Conservation Task Force by the National Speleological Society (U.S. Fish and Wildlife Service, unpublished).

Restoration of habitat as proposed by Humphrey (1978) may reverse the population decline. Education regarding biology of the bat and publicizing its economic importance regarding insect control will possibly prevent increased human disturbance (U.S. Fish and Wildlife Service, 1977).

Table 6. Indiana Bat *(Myotis sodalis)* Distribution in the Midwest

State	Counties	Sighting Date	Source
Illinois	Adams, Bond, Brown, Bureau, Calhoun, Carroll, Cass, Champaign, Christian, Clark, Clay, Clinton, Coles, Cook, Crawford, Cumberland, DeKalb, DeWitt, Douglas, DuPage, Edgar, Edwards, Effingham, Fayette, Ford, Franklin, Fulton, Gallatin, Greene, Grundy, Hamilton, Hancock, Henderson, Henry, Iroquois, Jackson, Jasper, Jefferson, Jersey, Johnson, Kane Kankakee, Kendall, Knox, Lake, Lawrence, Lee, Livingston, Logan, McDonough, McLean, Macon, Macoupin, Madison, Marion, Marshall, Mason, Menard, Mercer, Montgomery, Morgan, Moultrie, Ogle, Peoria, Piatt, Pike, Pope, Putnam, Randolph, Richland, Rock Island, St. Clair, Saline, Sangamon, Schuyler, Scott, Shelby, Stark, Stevenson, Tazewell, Vermilion, Walsh, Warren, Washington, Wayne, White, Whiteside, Will, Williamson, Woodford		24, 26
	Alexander, Boone, Massac, McHenry, Pulaski, Winnebago		24
	Hardin, Jo Daviess		2, 24, 26
	Monroe, Perry		4, 24, 26
	LaSalle		2, 24, 27
	Union		2, 4, 24, 26
(hibernacula)	Hardin, LaSalle		10, 27
	Monroe		4
	Union		27
Indiana	Adams, Allen, Bartholomew, Benton, Blackford, Brown, Carroll, Cass, Clinton, Daviess, Dearborn, Decatur, DeKalb, Elkhart, Fayette, Floyd, Fountain, Franklin, Gibson, Grant, Hamilton, Henry, Howard, Huntington, Jackson, Jasper, Jay, LaPorte, Madison,Marshall, Martin, Miami, Newton, Noble, Ohio, Orange, Perry, Pike, Porter, Posey, Pulaski, Putnam, Randolph, St. Joseph, Scott, Shelby, Spencer, Starke, Sullivan,		

Table 6. (Cont'd)

State	Counties	Sighting Date	Source
	Switzerland, Tipton, Union, Vermillion, Wabash, Warrick, Wells, White, Whitley		24, 26
	Boone, Clay, Crawford, Dubois, Greene, Hancock, Harrison, Hendricks, Jefferson, Johnson, Knox, Kosciuszko, LaGrange, Lawrence, Monroe, Montgomery, Morgan, Owen Parke, Ripley, Steuben, Tippecanoe, Vanderburgh, Vigo, Warren, Washington, Wayne		20, 24, 26, 28
	Fulton, Jennings, Lake, Marion		24, 26, 28
	Clark, Delaware		20, 24, 26
	Rush		6, 24, 26
(hibernacula)	Harrison, Lawrence, Owen, Washington		20, 28
	Crawford, Greene		10, 20, 27, 28
	Monroe		10, 20, 28
Iowa	Adair, Adams, Appanoose, Cedar, Clarke, Clayton, Clinton, Dallas, Davis, Decatur, Des Moines, Dubuque, Fremont, Henry, Iowa, Jackson, Jefferson, Johnson, Jones, Keokuk, Lee, Louisa, Lucas, Madison, Mahaska, Monroe, Montgomery, Muscatine, Page, Polk, Poweshiek, Ringgold, Scott, Taylor, Union, Van Buren, Wapello, Warren, Washington, Wayne		26
	Jasper, Marion		23, 26
(hibernacula)	Dubuque		23
Kansas	Atchison, Bourbon, Brown, Cherokee, Crawford, Doniphan, Jefferson, Johnson, Leavenworth, Linn, Miami, Wyandotte		26
Michigan	Allegan, Clinton, Eaton, Genesee, Iron, Kent, Ottawa, Shiawassee		26
	Berrien, Branch, Cass, Jackson, Kalamazoo, Lenawee, Van Buren		24, 26
	Calhoun, Hillsdale, St. Joseph, Washtenaw, Wayne		18, 24, 26
	Barry, Ingham, Livingston		18, 26

Table 6. (Cont'd)

State	Counties	Sighting Date	Source
	Monroe		24
Minnesota			
Missouri	Adair, Andrew, Atchinson, Audrain, Barry, Barton, Bates, Benton, Bollinger, Buchanon, Butler, Caldwell, Callaway, Cape Girardeau, Carroll, Carter, Cass, Cedar, Chariton, Christian, Clark, Clay, Cole, Cooper, Dade, Dallas, Daviess, DeKalb, Douglas, Gasconade, Gentry, Greene Grundy, Harrison, Henry, Hickory, Holt, Howard, Howell, Jackson, Jasper, Jefferson, Johnson, Lafayette, Lawrence, Lincoln, Livingston, McDonald, Macon, Madison, Maries, Moniteau, Montgomery, Newton, Oregon, Osage, Ozark, Perry, Pettis, Phelps, Pike, Platte, Polk, Putnam, Ralls, Randolph, Ray, Reynolds, Ripley, St. Charles, St. Clair, St. Francois, Ste. Genevieve, St. Louis, Saline, Schuyler, Scotland, Scott, Shelby, Stoddard, Sullivan, Texas, Vernon, Warren, Wayne, Webster, Worth		26
	Clinton, Dent, Knox, Lewis, Linn, Mercer, Monroe, Wright		15, 26
	Camden, Crawford, Franklin, Iron, Laclede, Pulaski, Washington		15, 21, 26
Missouri	Miller, Morgan, Stone, Taney		21, 26
	Boone, Nodaway		7, 21, 26
	Marion		15
	Shannon		9, 21, 26
(hibernacula)	Camden, Crawford, Franklin, Iron, Shannon, Washington		10
Nebraska	Nemaha, Pawnee, Richardson		26
Ohio	Allen, Ashland, Athens, Auglaize, Belmont, Butler, Carroll, Clark, Clinton, Coshocton, Crawford, Defiance, Erie, Fairfield, Fayette, Fulton, Gallia, Guernsey, Hamilton, Hancock, Hardin, Harrison, Henry, Holmes, Huron, Jackson, Knox, Lawrence,		

Table 6. (Cont'd)

State	Counties	Sighting Date	Source
	Logan, Lorain, Marion, Medina, Meigs, Mercer, Monroe, Montgomery, Morgan, Morrow, Muskingum, Noble, Ottawa, Perry, Pickaway, Preble, Putnam, Richland, Ross, Sandusky, Seneca, Shelby, Stark, Summit, Tuscarawas, Union, VanWert, Vinton, Warren, Washington, Wayne, Williams, Wyandot		24, 26
	Adams, Brown, Champaign, Clermont, Columbiana, Darke, Delaware, Franklin, Greene, Highland, Hocking, Jefferson, Licking, Lucas, Madison, Miami, Paulding, Pike, Scioto, Wood		5, 24, 26
	Ashtabula, Cuyahoga, Geauga, Mahoning, Portage, Trumbull		24
	Lake		5, 24
Wisconsin	Crawford, Grant, Green, Lafayette, Richland		24, 26
	Iowa		26

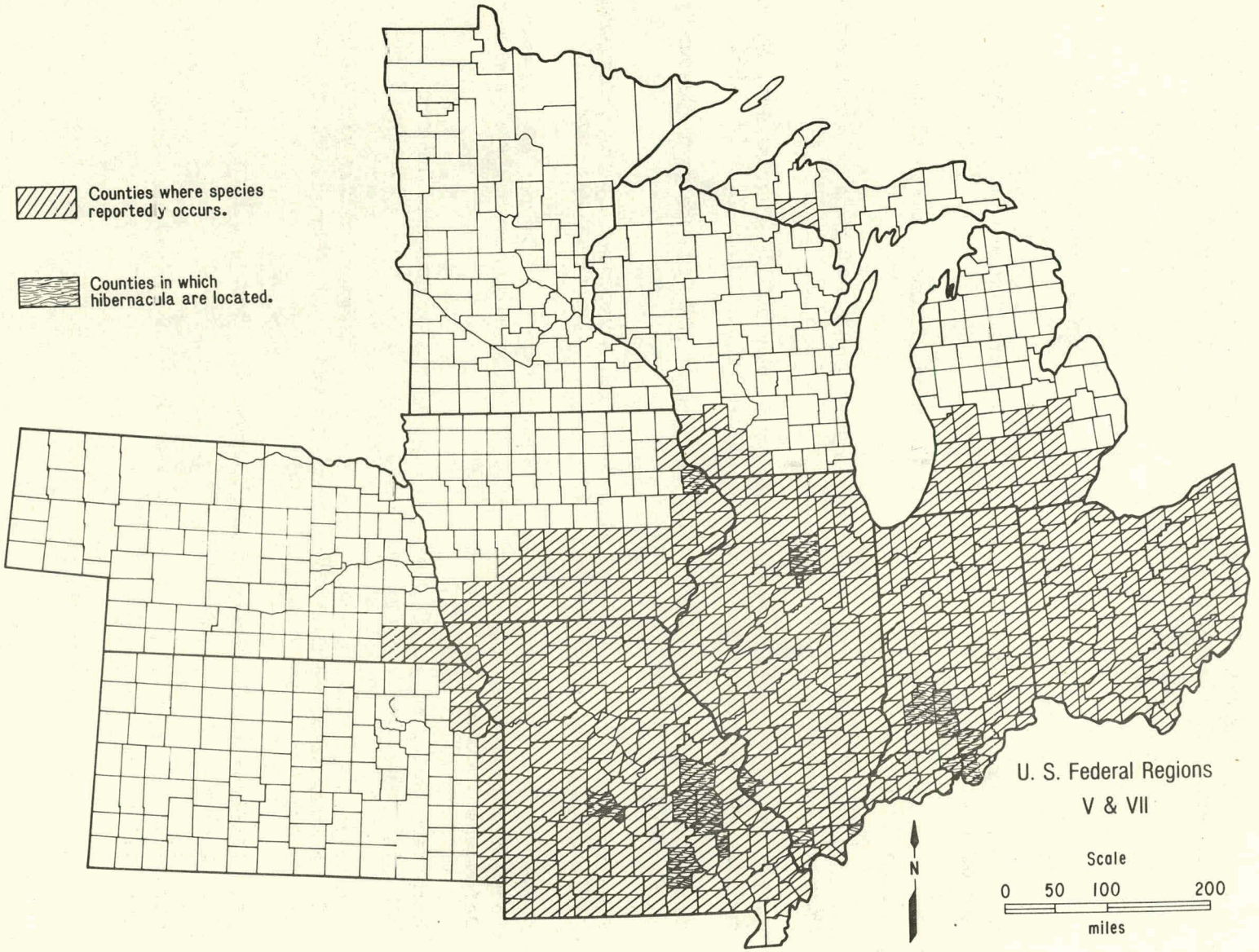

Fig. 5. Indiana Bat Distribution in the Midwest

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2.1.6 Northern Swift Fox (*Vulpes velox hebes*)

Status

This species is listed as endangered (U.S. Fish and Wildlife Service, 1979) and is very close to extinction.

Former Distribution

This subspecies was formerly common from the southern portions of British Columbia, Alberta, Saskatchewan, and Manitoba south to northeastern Utah, and the northern portions of Colorado, Nebraska, and Iowa (Goodwin and Holloway, 1976; U.S. Fish and Wildlife Service, unpublished).

Present Distribution

Now very sparsely distributed within the boundaries of its former range. In the Midwest, it has been sighted only in Nebraska.

Habitat

Swift fox habitat consists of open, short/midgrass prairies (U.S. Fish and Wildlife Service, unpublished). Occasionally, dens are excavated on agricultural lands (Nebraska Game and Parks Commission, 1977). However, these are temporary, relatively shallow, and infrequently used (Kilgore, 1969).

Reasons for Decline

The Nebraska Game and Parks Commission (1977) and Bunker (1940) report that the most probable reason for the rarity of this species is the use of poisoned baits for coyote control. Swift foxes are extremely susceptible to baited traps and will take the bait willingly (Bailey, 1905). Extensive conversion of grasslands, killing by farm implements, roadkills, trapping, shooting, and capture by dogs have also led to the endangerment of this species (Nebraska Game and Parks Commission, 1977; Allen, 1972; Kilgore, 1969).

Management Plans

Although Presidential order and EPA restrictions have regulated predator control programs (Nebraska Game and Parks Commission, 1977), Blus et al. (1967) propose that in order to prevent unnecessary killing, the public should be more adequately informed of the plight of the fox.

In addition, biologists must continue to study its status, distribution, and ecology, as well as to protect privately owned land harboring den sites. (Nebraska Game and Parks Commission, 1977).

Table 7. Northern Swift Fox (*Vulpes velox hebes*) Distribution in the Midwest

State	Counties	Sighting Date	Source
Illinois			
Indiana			
Iowa			
Kansas			
Michigan			
Minnesota			
Missouri			
Nebraska	Box Butte, Dawes, Kimball, Sioux	1975-1979	7
	Sheridan	1973-1975	8
	McPherson	1966	3
Ohio			
Wisconsin			

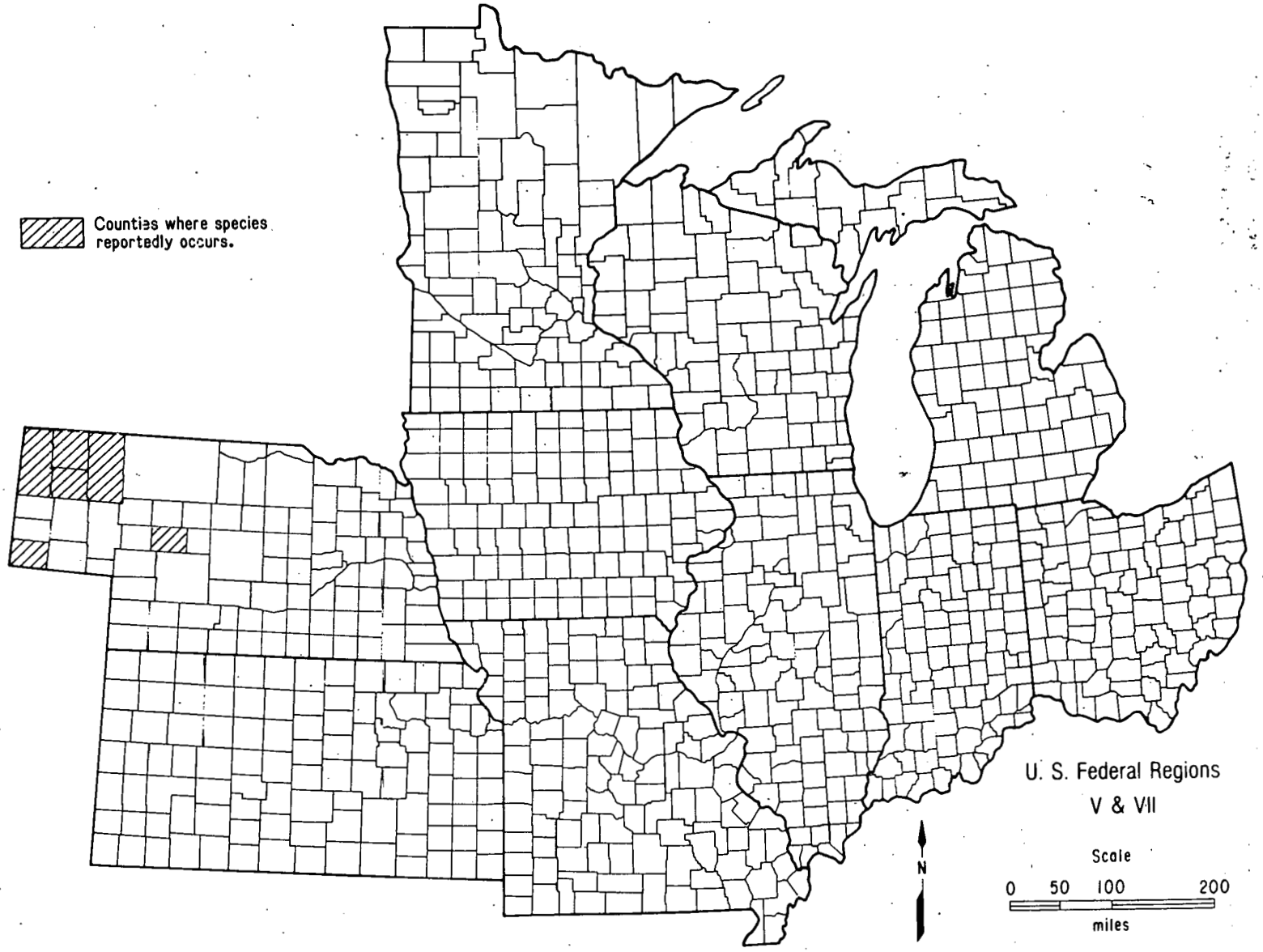

Fig. 6. Northern Swift Fox Distribution in the Midwest

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2.2 BIRDS

2.2.1 Peregrine Falcon (*Falco peregrinus*)

Subspecies - Arctic peregrine falcon (*F.p. tundrius*)
- American peregrine falcon (*F.p. anatum*)

Status

Both subspecies are endangered (U.S. Fish and Wildlife Service, 1979).

Former Distribution

Falco peregrinus tundrius - The Arctic peregrine formerly bred in the treeless tundra of North America from northern Alaska and Canada to western Greenland (Zimmerman, 1972). It migrated through the central and eastern United States to winter in the Gulf Coast states or Central or South America (U.S. Fish and Wildlife Service, 1977).

Falco peregrinus anatum - The American peregrine was originally found south of the aforementioned subspecies. Its range extended from the tree line in northern Alaska and Canada, where it integrated into the range of *F.p. tundrius*, south to Mexico, Texas, and the Gulf Coast (Zimmerman, 1972). The wintering grounds were also located in this area, although birds from the northern states and Canada moved south (U.S. Fish and Wildlife Service, 1977).

Present Distribution

F.p. tundrius - Present distribution is similar to former distribution.

F.p. anatum - This race is almost extirpated as a breeding bird east of the Rocky Mountains (Kaufman, 1976). Otherwise, its distribution is similar to what it formerly was.

Both species enter the Midwest during migration.

Habitat

These predators prefer open country -- tundra, prairies, marshes, and meadows -- with a wide view of the sky and a panorama below. Nesting places, or eyries, are usually located on elevated ledges or cliffs. Occasionally, skyscrapers in large cities may provide shelter for birds introduced into these areas. Such was the case with a female who successfully bred atop the Sun Life Insurance Building in Montreal for 16 years (Kaufman and Meng, 1975).

Reasons for Decline

Although habitat destruction, illegal shooting, and collection of birds for falconry have been factors, the primary cause for decline has been reproductive failure. Long-lived pesticide residues concentrate in these raptors, since they are terminal consumers (i.e., at the top of the food chain). Residue concentration has led to increased adult mortality and reduced productivity by altering reproductive mechanisms and causing eggs to become thin-shelled.

Management Plans

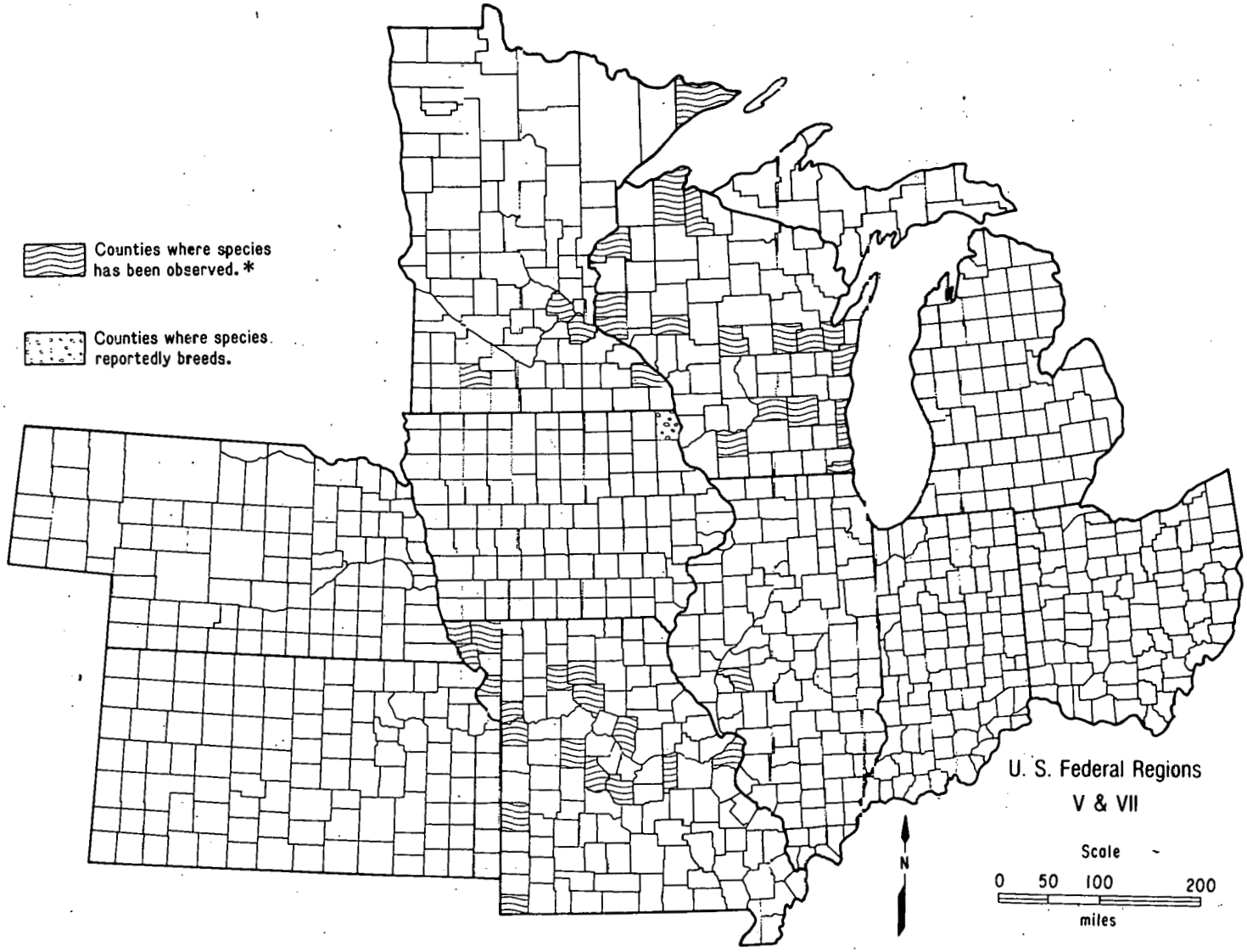
At New York's Cornell University, experienced falconers, such as Tom Cade, are raising peregrines under a captive-breeding program started in 1970. The goal of this project is to release birds into areas where they are no longer found (Kaufman, 1976). By 1978, 229 falcons had been raised and 133 released (Wade, 1978).

Other management proposals include reducing pesticide contamination of prey, forming international conservation agreements, initiating management-oriented research, and establishing refuges around known eyries (U.S. Fish and Wildlife Service, 1977).

Table 8. Peregrine Falcon (*Falco peregrinus*) Distribution in the Midwest[a]
Subspecies: American peregrine falcon (*F.p. anatum*) and
Arctic peregrine falcon (*F.p. tundrius*)

State	Counties	Sighting Date	Source
Illinois	Morgan		1
Indiana			
Iowa (breeding)	Allamakee	1959-1967	7
Kansas			
Michigan			
Minnesota	Cottonwood, Cook, Dakota, Hennepin, Winona	1962-1978	2
Missouri	Atchison, Boone, Buchanon, Chariton, Clay, Gasconade, Holt, Jackson, Linn, Livingston, McDonald, Miller, Morgan, Nodaway, Pettis, St. Louis, Vernon		6
Nebraska			
Ohio			
Wisconsin	Ashland, Bayfield, Brown, Burnett, Columbia, Dodge, Eau Claire, Iowa, Kenosha, Manitowoc, Milwaukee, Outagamie, Ozaukee, Pierce, St. Croix, Taylor, Waupaca, Wood	1972-1979	3

[a]Although these are the counties in which migrating peregrine falcons have been observed, they may potentially be found in any county within the study area.



*Although these are the counties in which migrating peregrine falcons have been observed, they may potentially be found in any county within the study area.

Fig. 7. Peregrine Falcon Distribution in the Midwest

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2.2.2 Bald Eagle (*Haliaeetus leucocephalus*)

Status

This species is endangered in most of the conterminous United States and threatened in Washington, Oregon, Minnesota, Wisconsin, and Michigan (U.S. Fish and Wildlife Service, 1979).

In 1975, the Wilson Ornithological Society estimated there were 3000 bald eagles breeding in the conterminous United States and 35,000-60,000 on the entire North American continent (Graham, 1976). Data from 1977 indicated 398 occupied nests (i.e. breeding pairs) in Iowa, Kansas, Missouri, and Nebraska (Madsen, 1977).

Former Distribution

According to Bull and Farrand (1977) and Hamerstrom et al. (1975), the bald eagle was formerly found throughout North America.

Present Distribution

This raptor is presently breeding throughout Alaska, Canada, and much of the contiguous United States (Marshall and Nickerson, 1976; U.S. Fish and Wildlife Service, 1977).

It winters in a large number of states in areas where food (consisting primarily of fish) is plentiful. (Lerg, 1979; Southern, 1963; U.S. Fish and Wildlife Service, 1977).

The bald eagle can be found throughout much of the Midwest (see Fig. 8).

Habitat

This large bird of prey is associated with riparian habitats that have minimal human inhabitation. Nesting sites vary tremendously, depending upon the species of trees within the particular area (Snow, 1973). For example, in Minnesota, 80-90% of the nests are located in large red (*Pinus resinosa*) and white pines (*P. strobus*) (Mathisen, 1968; MDNR, 1976). However, the U.S. Fish and Wildlife Service (unpublished) states that, according to Herrick (1924), sycamore (*Platanus spp.*) and shagbark hickory (*Carya laciniosa*) [sic] were the preferred nesting sites along Lake Erie.

More importantly, nest sites are characterized by the following elements: a clear flight path to a close point on the body of water, the presence of good perching trees, an open view of the surrounding area, and proximity to water harboring adequate fish populations (Snow, 1973).

Habitat requirements during winter are somewhat different. Northern eagles that migrate southward tend to congregate along rivers or lakes where water remains ice-free and wherever food is available, commonly around waterfalls, rapids, dams, and warm water outflows from power plants (Faanes, 1976; Ionen, 1973; Southern, 1963; 1964; Spencer, 1976).

Reasons for Decline

Loss of feeding and nesting sites due to man's activities have been a major factors in reducing this population. Pesticide contamination has also posed serious threats by causing direct mortality and by interfering with egg hatchability (Graham, 1976; U.S. Fish and Wildlife Service, 1977). Others reasons for decline include human disturbance, illegal shooting, and electrocution (Hamerstrom et al., 1975).

Management Plans

Many management and conservation strategies have been proposed for this species. Mathisen (1968) states that the official policy of the U.S. Forest Service prohibits all timber management activities within 132 feet of a nest tree and establishes a buffer zone of at least 660 feet during the nesting season.

Similarly, Hamerstrom et al. (1975) recommend establishment of refuges to protect nesting eagles. In addition, they advocate research and educational programs, and introduction efforts, and encourage the elimination of all harmful activities associated with this bird of prey (e.g., shooting, trapping, and poisoning).

In accordance with these recommendations, the Patuxent Wildlife Research Center in Maryland has developed facilities for the propagation of this eagle (Snow, 1973; Dunstan, 1978). Furthermore, the National Wildlife Federation, aided by a grant from Exxon Corporation, has established the Raptor Information Center. Its functions are to identify and protect habitat, to collect and distribute pertinent literature, and to encourage research and annual censuses (U.S. Fish and Wildlife Service, unpublished).

Table 9. Bald Eagle (*Haliaeetus leucocephalus*) Distribution in the Midwest

State	Counties	Sighting Date	Source
Illinois (breeding)	Union, Williamson		1
(wintering)	Brown, Cass, Christian, Franklin, Grundy, Henderson, Jefferson, Jersey, Johnson, LaSalle, Madison, Mercer, Monroe, Morgan, Peoria, Pike, Putnam, St. Clair, Sangamon, Schuyler, Scott, Tazewell, Union		15, 27
	Fulton, Jackson, Jo Daviess, Marshall, Mason, Randolph, Rock Island, Whiteside, Williamson, Woodford		2, 15, 27
	Adams, Alexander, Calhoun, Carroll, Hancock		1, 15, 27
	Greene, Menard, Pulaski		27
	Clinton, Fayette		15
	Will		2
Indiana (wintering)	Bartholomew, Fulton, Gibson, Jennings, Johnson, Marshall, Morgan, Scott, Starke, Vanderburgh, White		27
	Brown, Jackson, Jasper, Monroe, Posey		15, 27
	Pulaski		15
Iowa (wintering)	Along the Des Moines and Mississippi Rivers		21
Kansas (wintering)	Atchinson, Barton, Chase, Cherokee, Cheyenne, Clark, Clay, Coffey, Douglas, Ellis, Ellsworth, Finney, Geary, Gray, Greenwood, Hamilton, Hodgeman, Jefferson, Jewell, Kearny, Kingman, Lincoln, Linn, Lyon, Marion, Mitchell, Montgomery, Morris, Morton, Neosho, Norton, Osage, Osborne, Pawnee, Phillips, Pottawatomie, Reno, Republic, Riley, Rooks, Russell, Saline, Seward, Stafford, Trego, Wallace, Waubaunsee	1978-1979	22

Table 9. (Cont'd)

State	Counties	Sighting Date	Source
Michigan			
(breeding)	Alcona, Alger, Alpena, Baraga, Benzie, Cheboygan, Chippewa, Crawford, Delta, Dickerson, Gogebic, Houghton, Iosco, Iron, Kalkaska, Keweenaw, Luce, Mackinac, Manistee, Marquette, Mason, Menominee, Missaukee, Montmorency, Muskegon, Newaygo, Ogemaw, Ontonagon, Oscoda, Otsego, Roscommon, Saginaw Schoolcraft		14, 15, 27
	Bay, Genesee, Grand Traverse, Kent, Lake, Mecosta, Montcalm, Ottawa, Tuscola, Wexford		27
	Leelanau, Oceana, Presque Isle		15, 27
	Clare, Emmet		14
(wintering)	Alcona, Allegan, Alpena, Berrien, Calhoun, Cheboygan, Chippewa, Clare, Crawford, Dickinson, Emmet, Gogebic, Houghton, Iosco, Iron, Manistee, Mason, Mecosta, Menominee, Monroe, Muskegon, Newaygo, Ontonagon, Oscoda, Presque Isle, Roscommon, Saginaw, St. Clair, Schoolcraft	1969-1979	13
Minnesota			
(breeding)	Aitkin, Becker, Beltrami, Carlton, Clearwater, Cook, Hubbard, Itasca, Lake, Pine, St. Louis		9, 15, 27
	Chisago, Koochiching, Lake of the Woods, Roseau		15, 27
	Cass, Crow Wing		9, 15
(wintering)	Dakota, Goodhue, Houston, Sherburne, Wabasha, Washington, Winona		15, 27
Missouri			
(breeding)	Camden, Harrison, Hickory		20
(wintering)	Atchison, Barry, Bates, Benton, Bollinger, Boone, Buchanon, Butler, Callaway, Camden, Carroll, Carter, Cedar, Chariton, Clark, Clay, Clinton, Cole, Cooper, Dade, Dent, Franklin, Gasconade,		

Table 9. (Cont'd)

State	Counties	Sighting Date	Source
	Greene, Henry, Hickory, Holt, Howard, Howell, Jackson, Laclede, Lafayette, Lewis, Lincoln, Linn, Livingston, Macon, Marion, Miller, Moniteau, Montgomery, Morgan, Nodaway, Oregon, Osage, Ozark, Phelps, Pike, Platte, Polk, Pulaski, Ralls, Randolph, Ray, Reynolds, Ripley, St. Charles, St. Clair, St. Louis, Ste. Genevieve, Saline, Shannon, Stoddard, Stone, Taney, Texas, Vernon, Warren, Wayne		20
Nebraska (wintering)	Along the Missouri, Niobrara, Platte, and Republican Rivers		19
Ohio (breeding)	Erie, Ottawa, Sandusky		4, 15, 27
	Ashtabula, Lucas		4, 27
	Huron		27
(wintering)	Clermont		27
	Hamilton		15, 27
Wisconsin (breeding)	Ashland, Barron, Bayfield, Burnett, Douglas, Florence, Forest, Iron, Langlade, Lincoln, Marinette, Oconto, Oneida, Polk, Price, Sawyer, Taylor, Vilas, Washburn		11, 15, 27
	Dunn, Grant, Shawano		11
	Marathon, Rusk		15, 27
(wintering)	Buffalo, Crawford, Grant, LaCrosse, Pepin, Pierce, Trempealeau, Vernon		15, 27
	St. Croix		27

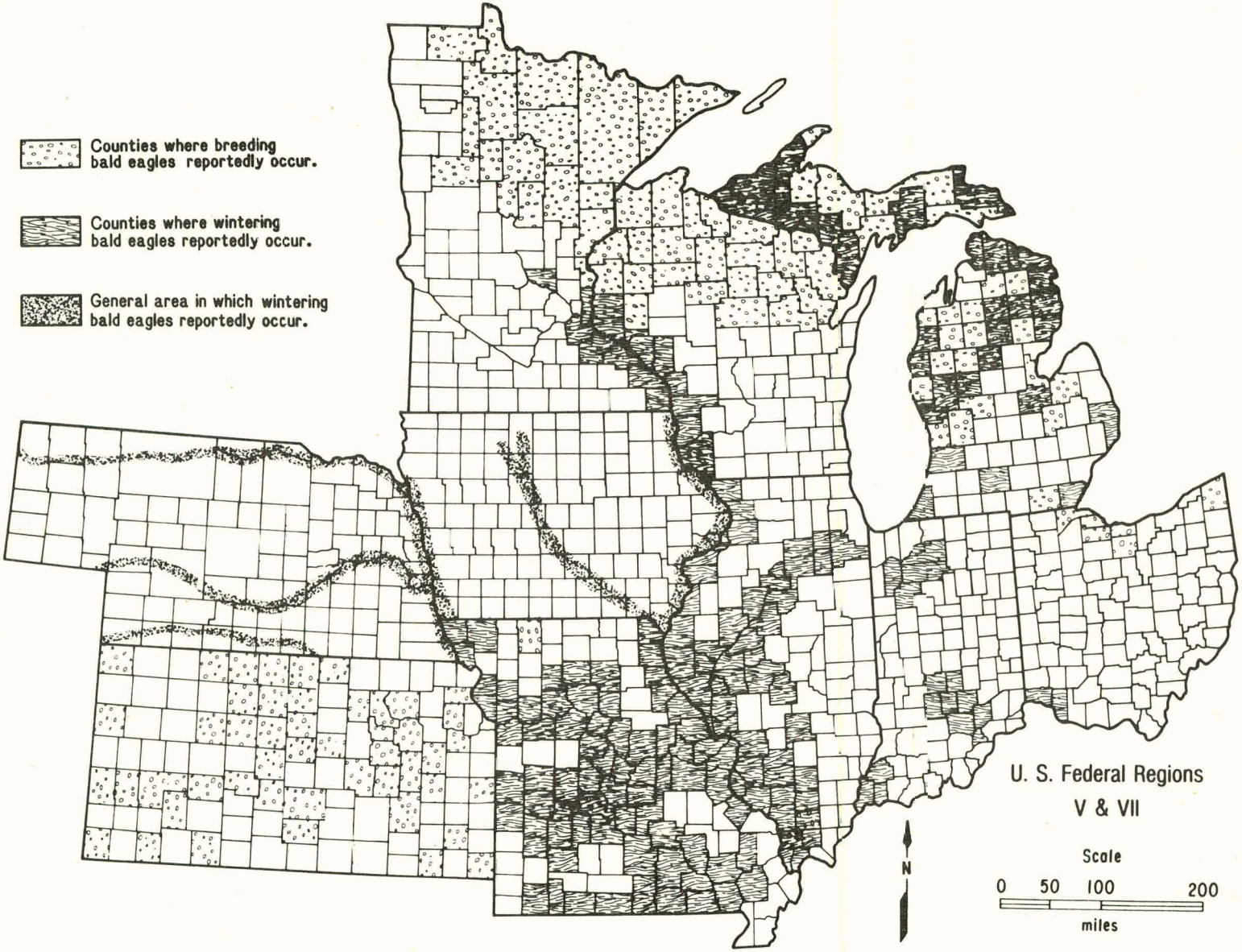

Fig. 8. Bald Eagle Distribution in the Midwest

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2.2.3 Eskimo Curlew (*Numenius borealis*)

Status

This species is listed as endangered (U.S. Fish and Wildlife Service, 1979). Although it was reported to be extinct in 1929 (Weston and Williams, 1965) a few observations of the eskimo curlew have been made since then. Migrants have been reported in Texas by Williams (1959), Emanuel (1961), and Webster (1963). Other sighting locations include South Carolina and New Jersey (Weston and Williams, 1965), the West Indies (WES, 1977), and Massachusetts (Marshall et al., 1975).

Former Distribution

This shorebird formerly bred in the Mackenzie District of Canada and wintered in Patagonian Argentina. Migratory routes during the fall followed the Atlantic Coast, whereas those in spring extended through the Great Plains of the United States (Bent, 1929).

Present Distribution

Unknown. Unless extinct, the distribution is probably similar to what it once was. Although the Eskimo curlew has not been recently sighted in the Midwest, it has been observed during migration in other states after 1959. Since the bird flies over the study area only during its spring migration, the possibility remains that it may be found here. In other words, it is believed that this shorebird has not been extirpated, but is so rare that few observations have been made.

Habitat

Apparently habitat within the continental U.S. is not a critical factor. However, records indicate that occasional migrants have been spotted feeding in this country. In these instances, habitat has consisted of sand flats and bars, grassy fields, and salt flats (Weston and Williams, 1965; Hagar and Anderson, 1977).

Reasons for Decline

The most influential factor related to the present status of the curlew has been market hunting. In a plight similar to that of the passenger pigeon (*Ectopistes migratorius*), millions were ruthlessly slaughtered in the late 1800s (Banks, 1977; Bent, 1929).

Many other factors have purportedly contributed to the endangerment of this species. Crop cultivation and modification of grassland habitat on the wintering grounds and along the spring migratory route have been suggested by

Cooke (1910), Wetmore (1926), Bent (1929), Todd (1963), and Rising (1974). Severe weather during migration may have also been a factor, as suggested by Townsend and Allen (1907).

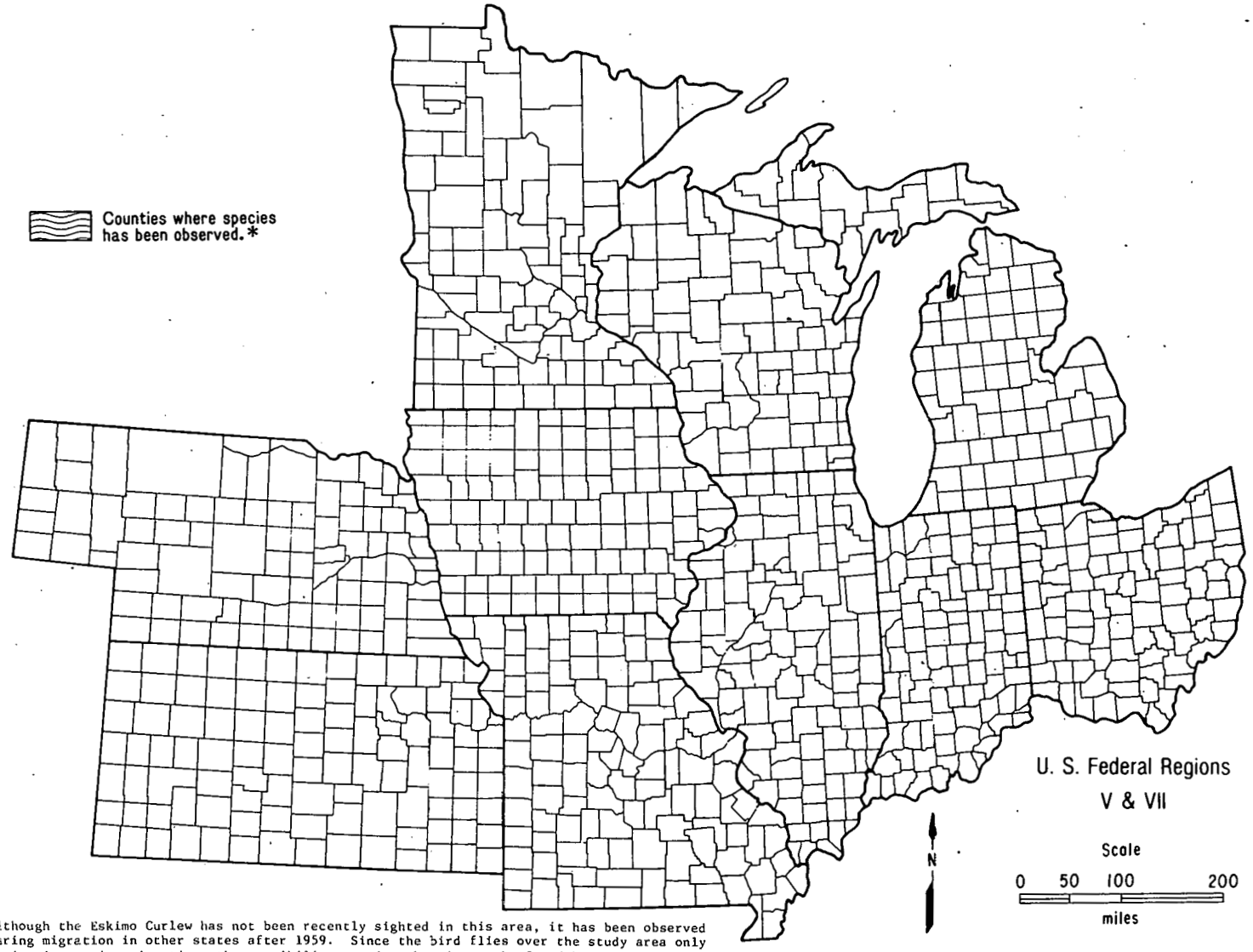
Management Plans

Besides full protection from hunting, the Canadian Wildlife Service is alert to any information regarding the present status of this rare bird (Vincent, 1969).

Protective measures proposed for this shorebird include surveys to locate breeding and wintering populations and complete protection from any possible disturbances (Bureau of Sport Fisheries and Wildlife, 1973).

Table 10. Eskimo Curlew (*Numenius borealis*) Distribution in the Midwest

State	Counties	Sighting Date	Source
Illinois			
Indiana			
Iowa			
Kansas			
Michigan			
Minnesota			
Missouri			
Nebraska			
Ohio			
Wisconsin			



*Although the Eskimo Curlew has not been recently sighted in this area, it has been observed during migration in other states after 1959. Since the bird flies over the study area only during its spring migration, the possibility remains that it may be found here. In other words, it is believed that this shorebird has not been extirpated, but is so rare that few observations have been made.

Fig. 9. Eskimo Curlew Distribution in the Midwest

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2.2.4 Kirtland's Warbler (*Dendroica kirtlandii*)

Status

This species is endangered (U.S. Fish and Wildlife Service, 1979). The adult population has fluctuated around 200 pairs since 1971 (Ryel, 1979).

Former Distribution

According to Vincent (1966), the former range was undoubtedly more widespread than it is today. He states that there are records of observations in Minnesota, Ontario, Illinois, Missouri, and Virginia, all of which are outside the expected migration route to the present breeding grounds.

Present Distribution

This warbler presently breeds in a few counties in northern Michigan. It may also be found occasionally in Wisconsin and in Quebec and Ontario, Canada (Ryel, 1979). Wintering habitat is restricted to the Bahama Islands (Vincent, 1966).

Habitat

The breeding habitat of this ground-nesting bird consists entirely of dense 8-21 year old (2-6m high) jack pine (*Pinus banksiana*) stands resulting from forest fires, controlled burning, or artificial plantings. Such stands are generally 30 hectares (ha) or larger and interspersed with many small openings (Radtke and Byelich, 1963; U.S. Fish and Wildlife Service, unpublished). It is interesting to note that, with few exceptions, all nests have been found on soils that consist of highly permeable grayling sand (KWRT, 1976).

The preferred wintering habitat is not known. However, Radabaugh (1974) suggests that these songbirds may use the low broad-leaved scrub prevailing on the Bahama Islands.

Reasons for Decline

Warbler populations have declined due to loss of the specialized habitats they require and due to parasitism of the nests by brown-headed cowbirds (*Molothrus ater*) (Vincent, 1966). One other limiting factor, as yet unidentified, occurs during migration or on the wintering grounds--approximately threefold more birds fly south in the fall than return in the spring (KWRT, 1976).

Management Plans

To reach the Recovery Team's goal of increasing the population from 211 to 1,000 pairs, management efforts must be aimed at producing large expanses of suitable habitat (Ryel, 1979; KWRT, 19766). In 1957, the Michigan Department of Natural Resources set aside 3,100 ha to be managed specifically for the species (Mayfield, 1978). Similar efforts have been undertaken by the U.S. Forest Service in 1961, which set aside 1,700 ha in Michigan's Huron National Forest (Radtke and Byelich, 1963; Mayfield, 1963).

Other management efforts have concentrated on cowbird parasitism. Since its start in 1972, cowbird trapping has been an overwhelming success. Prior to such control, warbler nesting success averaged 1.4 fledglings/pair. Today the success rate is 4 fledglings/pair (U.S. Fish and Wildlife Service, unpublished). Parasitism has dropped from approximately 70% to under 5% (Mayfield, 1978).

Other proposed measures include more complete studies on breeding habitat requirements (such as those being conducted by the North Central Forest Experiment Station in Minnesota). Further research and protection along the migration route and on the wintering grounds are also needed (J. Probst, personal communication; U.S. Fish and Wildlife Service, 1979).

Table 11. Kirtland's Warbler (*Dendroica kirtlandii*) Distribution in the Midwest

State	Counties	Sighting Date	Source
Illinois			
Indiana			
Iowa			
Kansas			
Michigan	Crawford, Iosco, Kalkaska, Montmorency, Ogemaw, Oscoda, Otsego, Presque Isle, Roscommon, Wexford	1961-1979	7, 8, 10
	Alcona, Alpena		8, 10
	Clare		10
	Missaukee		8
Minnesota			
Missouri			
Nebraska			
Ohio			
Wisconsin	Jackson		7, 8

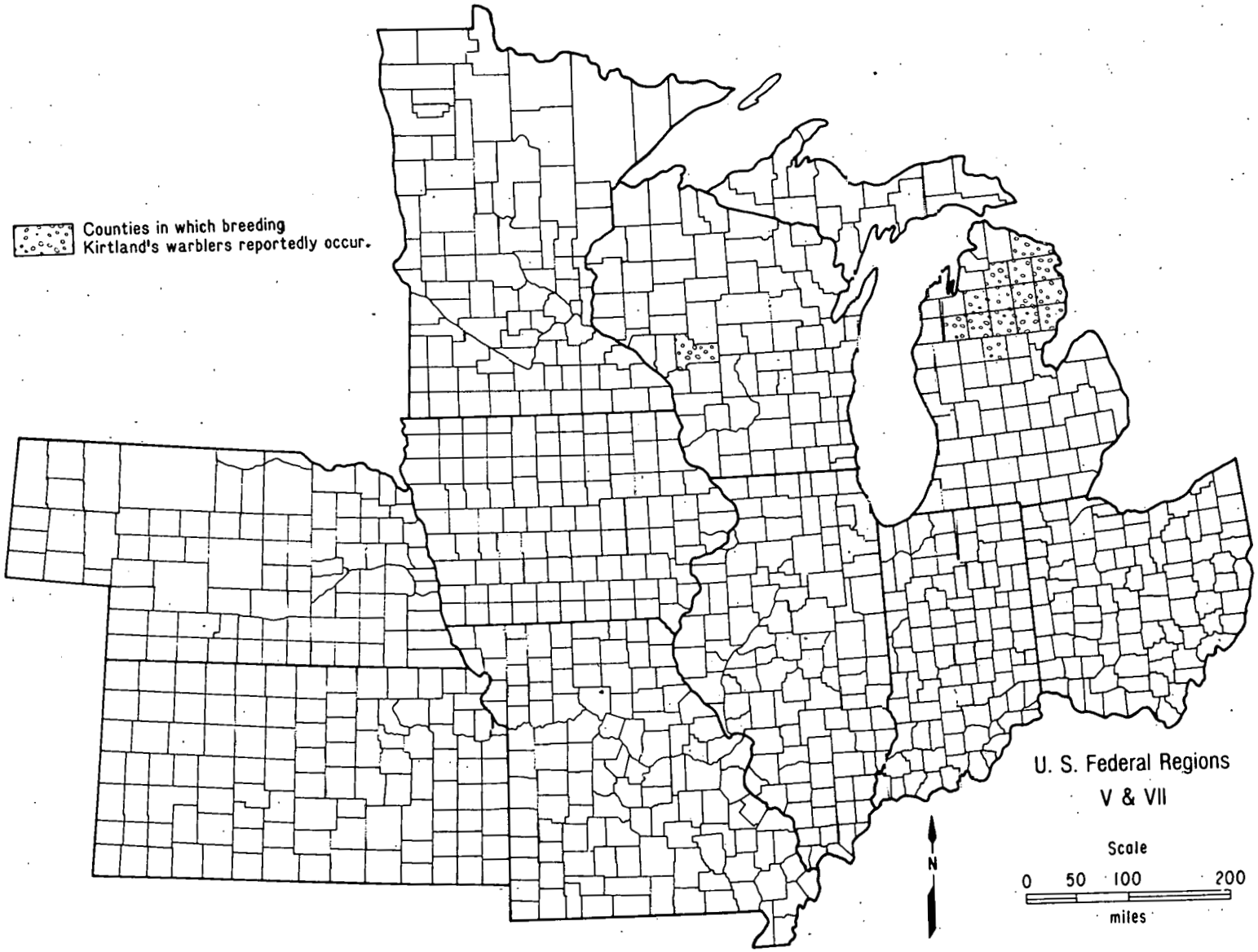

Fig. 10. Kirtland's Warbler Distribution in the Midwest

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2.2.5 Whooping Crane (*Grus americana*)

Status

Endangered (U.S. Fish and Wildlife Service, 1979). After reaching a low point of 21 birds in 1941, the population has now grown to 108 (Sayre, 1979; WCRT, 1977).

Former Distribution

The historic breeding range appears to have been a narrow belt from central Illinois through northern Iowa, western Minnesota, northeastern North Dakota, and the southern portions of Manitoba, Saskatchewan, and Alberta.

Another population, believed to have been nonmigratory, existed in southwestern Louisiana prior to its extermination in 1948.

A third isolated breeding population, the only wild population that has managed to survive, was discovered in 1954 in Wood Buffalo National Park, Northwest Territories, Canada (WCRT, 1977).

Historically, there were four different migration routes. The two most important were the one between Louisiana and the nesting grounds in Illinois, Iowa, Minnesota, North Dakota, and Manitoba and the one between Texas and the Rio Grande delta region to the nesting grounds in North Dakota and the Canadian provinces (Allen, 1952). The third route, extending across the Appalachians to the Atlantic seaboard, was probably insignificant. The last path followed that of the sandhill cranes (*Grus canadensis*) from the northern Rocky Mountains of Montana and Idaho into Mexico (WCRT, 1977).

Present Distribution

A flock of 74 birds breeds in Wood Buffalo National Park, Northwest Territories, Canada and winters on the Gulf Coast of Texas (Vincent, 1969). An additional flock of 9 birds has been established in Grays Lake National Wildlife Refuge (Idaho); these birds winter at Bosque del Apache National Wildlife Refuge (New Mexico). The remaining 25 birds are captive (Sayre, 1979).

Habitat

Breeding habitat is largely muskeg interspersed with black spruce (*Picea mariana*), tamarack (*Larix laricina*), and willows (*Salix spp.*) (U.S. Fish and Wildlife Service, unpublished; WES, 1977). Wintering habitat consists of salt marshes on which salt grass (*Distichlis spicata*), saltwort (*Batis maritima*), popping cane (*Spartina alterniflora*) and similar species grow. Occasionally, whoopers may enter to feed in the sandy, gently rolling Oak-Redbay (*Quercus spp. - Persea borbomia*) uplands adjacent to these marshes (WCRT, 1977).

The major requirement in habitat selection, particularly during migration, is an open expanse for nightly roosting. Frequently, whoopers will use sand or gravel bars in rivers, lakes, or reservoirs (U.S. Fish and Wildlife Service, 1978).

Reasons for Decline

Many factors have been responsible for the endangerment of *G. americana*. Alteration/loss of habitat (from agriculture, dams, housing developments, and mining), shooting pressure, collision with power lines, and adverse weather have been detrimental (Flanery, 1979; U.S. Fish and Wildlife Service, 1978; Vincent, 1969; WCRT, 1977). Increased disturbance from human settlement has also been important. For instance, whooping cranes shun areas of human disturbance even though the habitat is suitable (U.S. Fish and Wildlife Service, unpublished).

Strict adherence to traditional breeding areas, migratory routes, and wintering grounds has left little possibility of pioneering new regions. With such limited numbers, populations can only grow slowly, owing to the low reproductive potential of the birds and their susceptibility to natural mortality factors (e.g., sibling aggression, food scarcity, fire) (WRCT, 1977).

Potential problems facing the crane include oyster shell dredging, which increases water turbidity and adversely affects invertebrate prey populations, and contact with hazardous materials on the heavily industrialized Texas Gulf Coast (WRCT, 1977).

Management Plans

Research and management for the whooper are quite extensive. The WCRT (1977) reports that surveys, research, and management are being conducted on both the breeding and wintering grounds. In addition, numerous agencies are monitoring migrations and carrying out propagation and research programs with captive individuals. The International Crane Foundation in Wisconsin and the Patuxent Wildlife Research Center in Maryland are two such agencies studying captive cranes. One unique effort of the Patuxent Wildlife Research Center is a cross-fostering program of whooping cranes by sandhill cranes (*G. canadensis*). The goal of this project is to establish an additional independent population at Grays Lake National Wildlife Refuge in Idaho so that a single calamity could not destroy the entire population (Kuyt, 1976).

In addition to the above, a $7.5 million trust fund has been established to protect whooper habitats along the Platte River in Nebraska. Customers of the area's rural electric power companies are being billed to support this project (Indianapolis Star, 1979).

Finally, education and publicity are also playing a great role in saving this endangered species (Walkinshaw, 1973; WCRT, 1977).

Future management considerations include the continuation of large-scale rearing/cross-fostering programs, establishment of additional refuge areas and continuation of publicity programs (Bureau of Sport Fisheries and Wildlife, 1973; U.S. Fish and Wildlife Service, unpublished).

Classification Criteria for Whooping Crane Observations

Sightings listed in the whooping crane distribution data (Table 11) are classified according to three observation criteria as follows.

Verified observations are those made by a state or federal biologist or officer or any other qualified personnel (e.g., trained ornithologist or experienced birdwatcher).

Probable observations are those made by unqualified personnel. However, details, consistency, and reliability seem to identify the birds as whooping cranes. To be classified as such, the sighting must meet each of the following requirements of the U.S. Fish and Wildlife Service: "(1) location of sighting is within normal migration corridor and is an appropriate site for whooping cranes, (2) date of sighting is within period of migration, (3) accurate physical description, (4) number of birds is reasonable, (5) behavior of the birds does not eliminate whooping cranes, and (6) good probability that observer would provide reliable report."

Unconfirmed observations are those made by unqualified personnel with details, consistency, and/or reliability in question. Such sightings do not meet all of the six aforementioned criteria.

Table 12. Whooping Crane (*Grus americana*) Distribution in the Midwest

State		Counties	Sighting Date	Source
Illinois				
Indiana				
Iowa				
Kansas	(verified observations[a])	Cloud, Decatur, Graham, Jewell Meade, Pawnee, Phillips, Pratt, Rawlins, Rice, Russell, Trego	1962-1978	15
		Barton, Stafford		10, 15
		Reno		10
	(probable observations[a])	Barber, Harper	1978	15
	(unconfirmed observations[a])	Atchison, Butler, Clark, Ellsworth, Finney, Johnson, Sedgwick, Shawnee	1975-1978	15
Michigan				
Minnesota		Kittson	1978	4
Missouri				
Nebraska	(verified observations[a])	Adams, Dawson, Keya Paya, Loup, Valley, Webster		10
		Cherry, Cheyenne, Frontier, Furnas, Grant, Hamilton, Hitchcock, Keith	1964-1979	15
		Blaine, Brown, Buffalo, Custer, Franklin, Gosper, Hall, Harlan, Kearney, Phelps, Rock, Sherman, Thomas	1959-1979	10, 15
	(probable observations[a])	Hayes, Howard, Lincoln	1976-1978	15
	(unconfirmed observations[a])	Lancaster	1975	15
Ohio				
Wisconsin				

[a]See text for classification criteria for whooping crane observations.

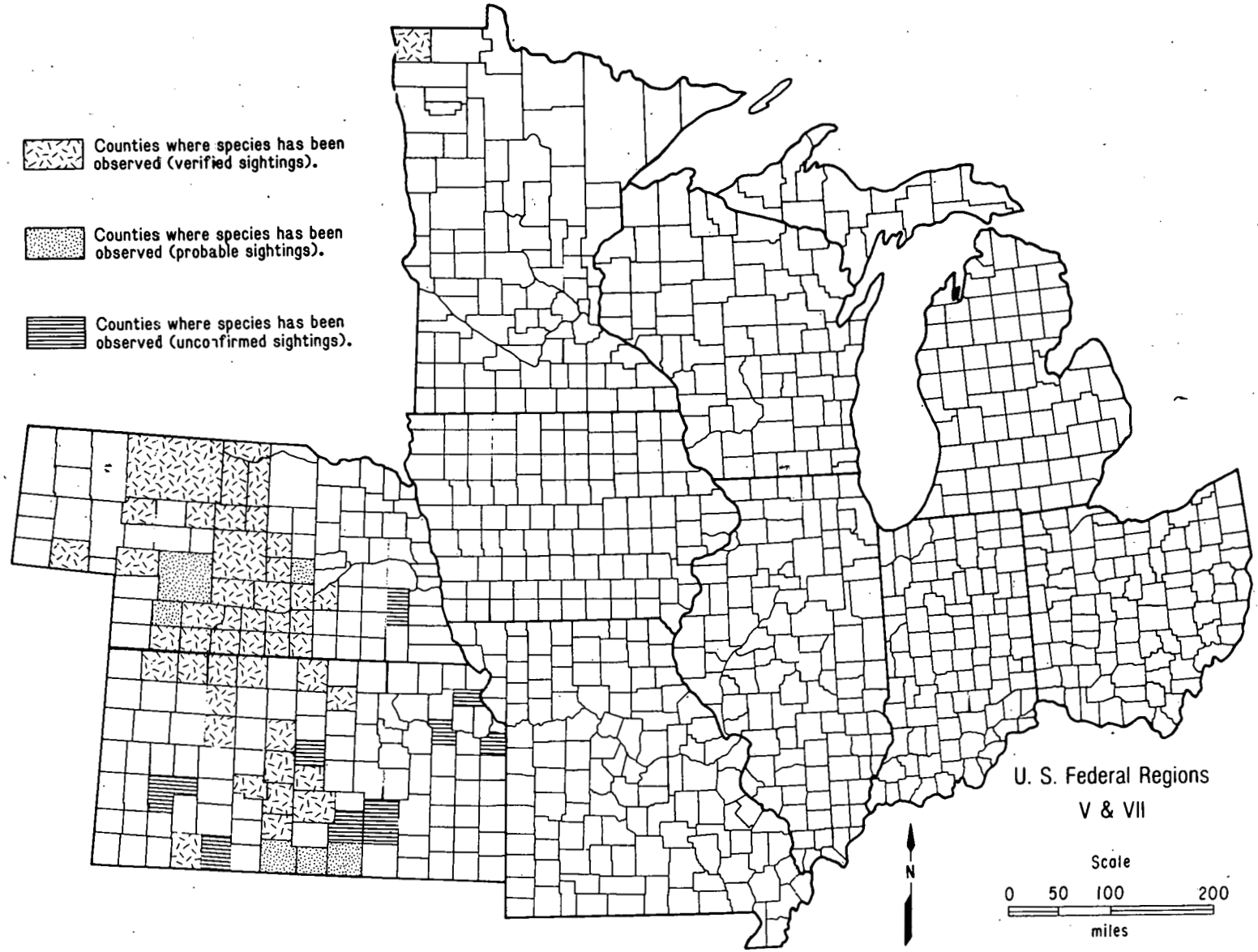

Fig. 11. Whooping Crane Distribution in the Midwest

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2.3 FISH

2.3.1 Blue Pike (*Stizostedion vitreum glaucum*)

Status

This species is endangered (U.S. Fish and Wildlife Service, 1979). Once an important commercial species of Lakes Erie and Ontario, the blue pike is now rare and possibly extinct (U.S. Fish and Wildlife Service, 1977). In fact, the Blue Pike Recovery Team has reported it as extinct (S. Smith, personal communication).

Originally this fish was thought to be a separate species (*Stizostedion glaucum*). However, the blue pike (or blue walleye) is now officially recognized, along with the yellow walleye (*S.v. vitreum*), to be distinct subspecies of the walleye (*S. vitreum*) (Scott and Crossman, 1973). Some experts believe, however, that *S.v. glaucum* is just a color variation of the walleye (*S. vitreum*).

The grey-blue walleyes of Lake Nipissing, Ontario have long been considered by some to be blue pike. According to information available to Scott and Crossman (1973), this hypothesis can neither be proven nor rejected. One interesting fact is that the grey-blue walleyes occur more frequently during years in which yellow walleyes dominate the fishery (Scott and Crossman, 1973).

Former Distribution

Formerly found throughout Lakes Erie and Ontario and the lower Niagara River. Its occurence in Lake Nipissing, Ontario is debatable (Scott and Crossman 1973).

Present Distribution

Now rare in those areas mentioned under Former Distribution.

Habitat

The blue pike has been found in the cool, deeper waters of the previously mentioned lakes (U.S. Fish and Wildlife Service, 1977). Critical habitat within Lake Erie ranges in depth from 20 to 150 feet with water temperatures below 70°F (BPRT, 1975).

Reasons for Decline

With the deteriorating physical, chemical, and biological environment within these two Great Lakes, conditions have become unfavorable for the survival of eggs and young. Severe oxygen depletion in Lake Erie has been

an obvious contributing factor (U.S. Fish and Wildlife Service, 1977). Other reasons for decline include overharvesting and, possibly, sea lamprey (*Petromyzon marinus*) parasitism (Engel, 1978).

Management Plans

In 1969, a pair of *Stizostedion*, believed to be blue pike, spawned in a Pennsylvania hatchery. Nine thousand of the fry were later transferred to a hatchery in South Dakota. In addition, some of the Pennsylvania fingerlings were introduced into an isolated lake in northern Minnesota (U.S. Fish and Wildlife Service, 1977), but it is unknown into which lake that introduction occurred.

As mentioned by Engel (1978), a recovery plan has been completed, which emphasizes artifical propagation, stocking, and protection of natural and planted stocks. However, all recent attempts to secure broodstock have failed.

If possible, a future management consideration for this fish includes retaining an additional spawning stock for reintroduction purposes (U.S. Fish and Wildlife Service, 1977).

Table 13. Blue Pike (*Stizostedion vitreum glaucum*) Distribution in the Midwest

State	Lake	Sighting Date	Source
Illinois			
Indiana			
Iowa			
Kansas			
Michigan	Erie		1, 5
Minnestoa			
Missouri			
Nebraska			
Ohio	Erie		1,5
Wisconsin			

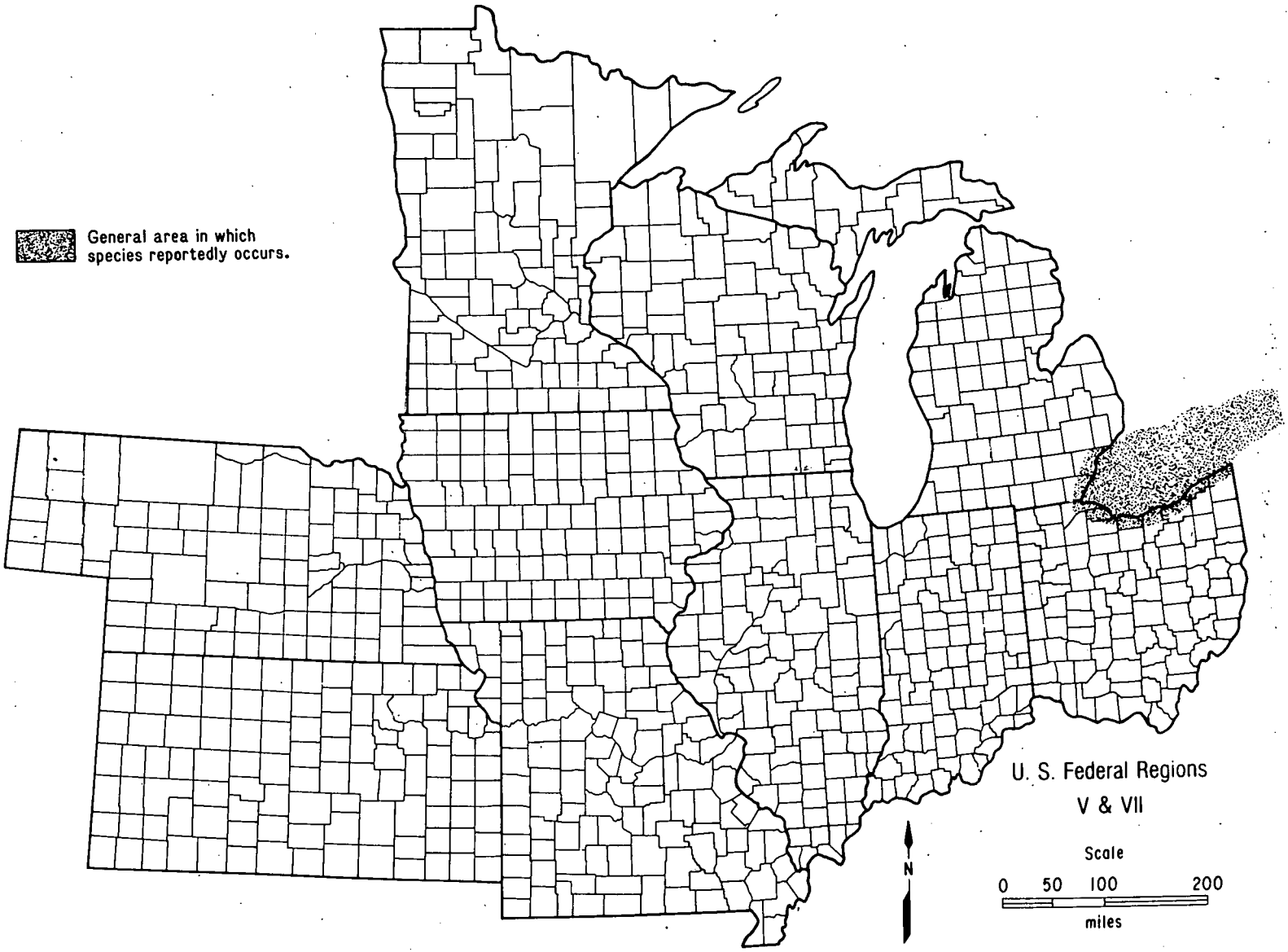

Fig. 12. Blue Pike Distribution in the Midwest

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2.3.2 Longjaw Cisco (*Coregonus alpenae*)

Status

This species is endangered (U.S. Fish and Wildlife Service, 1979). Once an important constituent of the commercial chub catch, this species was last known to occur in the Great Lakes at the following times:

Grand Traverse Bay, Lake Michigan - 1967
Georgian Bay, Lake Huron - 1975
Long Point, Lake Erie - 1957

(U.S. Fish and Wildlife Service, 1977, supplement April, 1978). According to personnel from the Michigan Department of Natural Resources, this species is extinct (MDNR, personal communication).

Former Distribution

Longjaw ciscoes were formerly abundant in Lakes Erie, Huron, and Michigan (U.S. Fish and Wildlife Service, 1977).

Present Distribution

Current distribution is unknown (see above).

Habitat

Most often found in intermediate to deep regions of the Great Lakes (greater than 20 fathoms) (U.S. Fish and Wildlife Service, 1977).

Reasons for Decline

In Lake Erie, the limited habitat of this species has become increasingly unfavorable because of pollution. Sea lamprey (*Petromyzon marinus*) parasitism, intensive commercial fishing, and competition from the small bloater (*Coregonus hoyi*) and alewife (*Alosa pseudoharengus*) have contributed to the decline in Lakes Huron and Michigan (U.S. Fish and Wildlife Service, 1977).

Management Plans

Intensive studies of southern Lake Michigan during 1962-1964 resulted in only 7 ciscoes being taken (U.S. Fish and Wildlife Sevice, 1977). No present management plans are known and a recovery plan is not feasible (Engel, 1978).

If spawning fish can be obtained, the species might be protected by planting the young in remote, deep-water lakes (U.S. Fish and Wildlife Service, 1977).

Table 14. Longjaw Cisco (*Coregonus alpenae*) Distribution

State	Lake	Sighting Date	Source
Illinois	Michigan	1967	3
Indiana	Michigan	1967	3
Iowa			
Kansas			
Michigan	Michigan	1967	3
	Huron	1975	3
Minnesota			
Missouri			
Nebraska			
Ohio			
Wisconsin	Michigan	1967	3

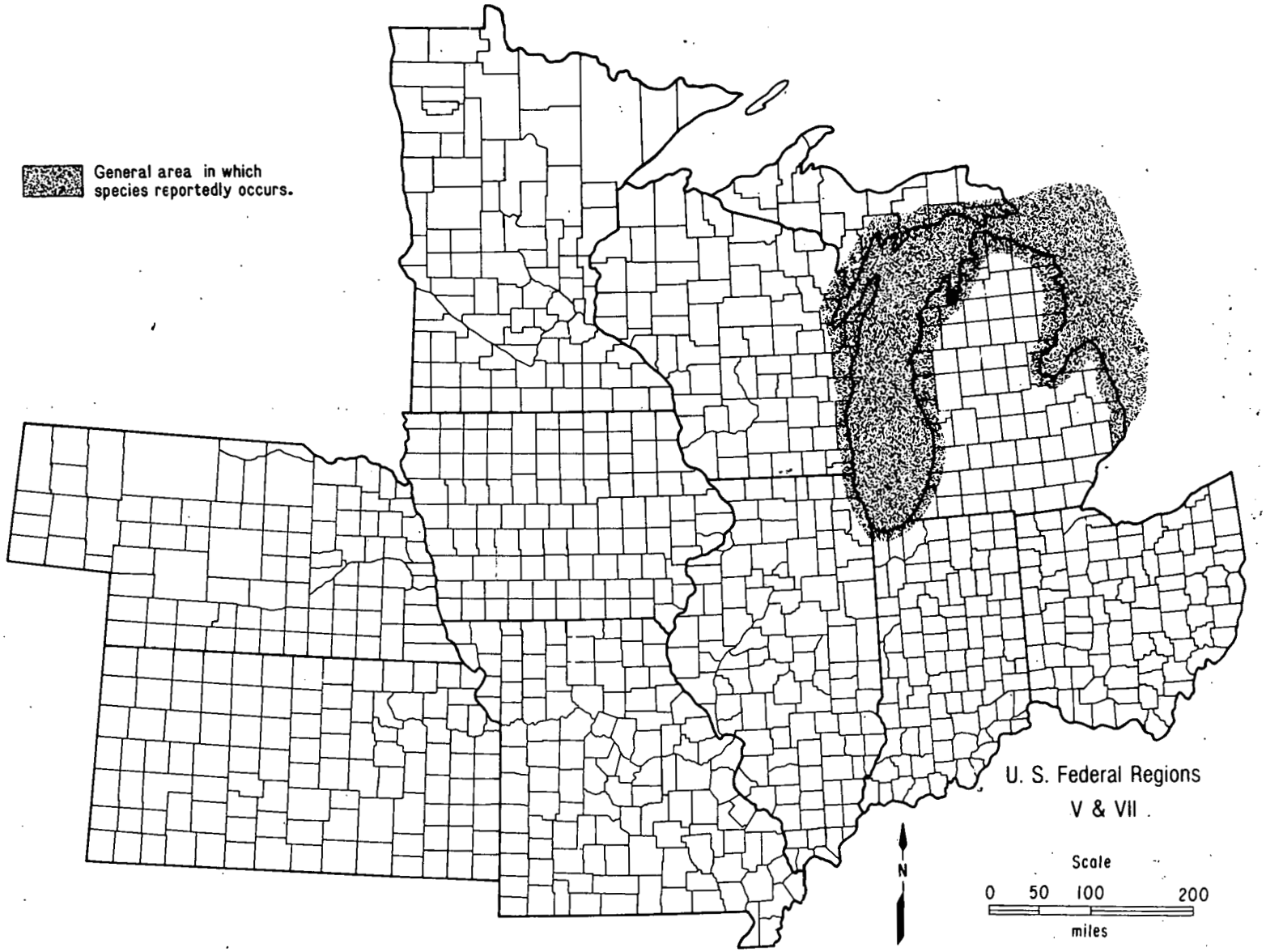

Fig. 13. Longjaw Cisco Distribution in the Midwest

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2.4 MOLLUSKS

2.4.1 Iowa Pleistocene Snail (*Discus macclintocki*)

Status

This species is endangered (U.S. Fish and Wildlife Service, 1979). The population appears healthy, with at least 100 live individuals (Anonymous, 1976).

Former Distribution

Fossils have been found in loess in Illinois, Iowa, and Missouri. There are a few specimens from Arizona in the National Museum of Canada but the locale of origin as believed to be erroneous (Grimm, 1972).

Present Distribution

The main concentration of living *D. macclintocki* is an area 10 feet long and a foot wide at the mouth of a cave in Clayton County, Iowa (Hubricht, 1972). Four additional pockets near the cave (with a total area of 40 feet by 150 feet) have since been located by researchers (Anonymous, 1976).

Habitat

The habitat in which this species exists is quite unique. The "ice cave" to which it is confined retains ice throughout the year and vents cool, moist air (37-47°F with 60-70% humidity) onto a wooded slope that receives about 1/2 hour of direct sunlight each day. Specimens of *D. macclintocki* occur in talus, leaf cover, under logs, and in pockets of leaf mold (Anonymous, 1976; L. Visscher, personal communication).

Reasons for Decline

Climatic change since the last glaciation (i.e., warmer summers and cooler winters) have restricted this stenothermic organism to its present habitat. Although it is preyed upon by cychrine beetles and shrews, predation does not appear to be an imminent danger. A more important factor could be collecting by scientists and amateurs (Grimm, 1972; Hubricht, 1972; Anonymous, 1976). It has also been suggested that flooding could eliminate this species as it has threatened another endangered snail in California (Anonymous).

Management Plans

The ecology should be studied in more detail and the proper authorities be informed as to the locations and extent of *D. macclintocki* colonies. Rearing a few individuals under refrigeration might allow them to increase for possible introduction elsewhere. However, the most important protective measure is to prevent disturbance by not publicizing information (Grimm, 1972, Anonymous, 1976).

Table 15. Iowa Pleistocene Snail (*Discus macclintocki*) Distribution in the Midwest

State	Counties	Sighting Date	Source
Illinois			
Indiana			
Iowa	Clayton		1, 4
Kansas			
Michigan			
Minnesota			
Missouri			
Nebraska			
Ohio			
Wisconsin			

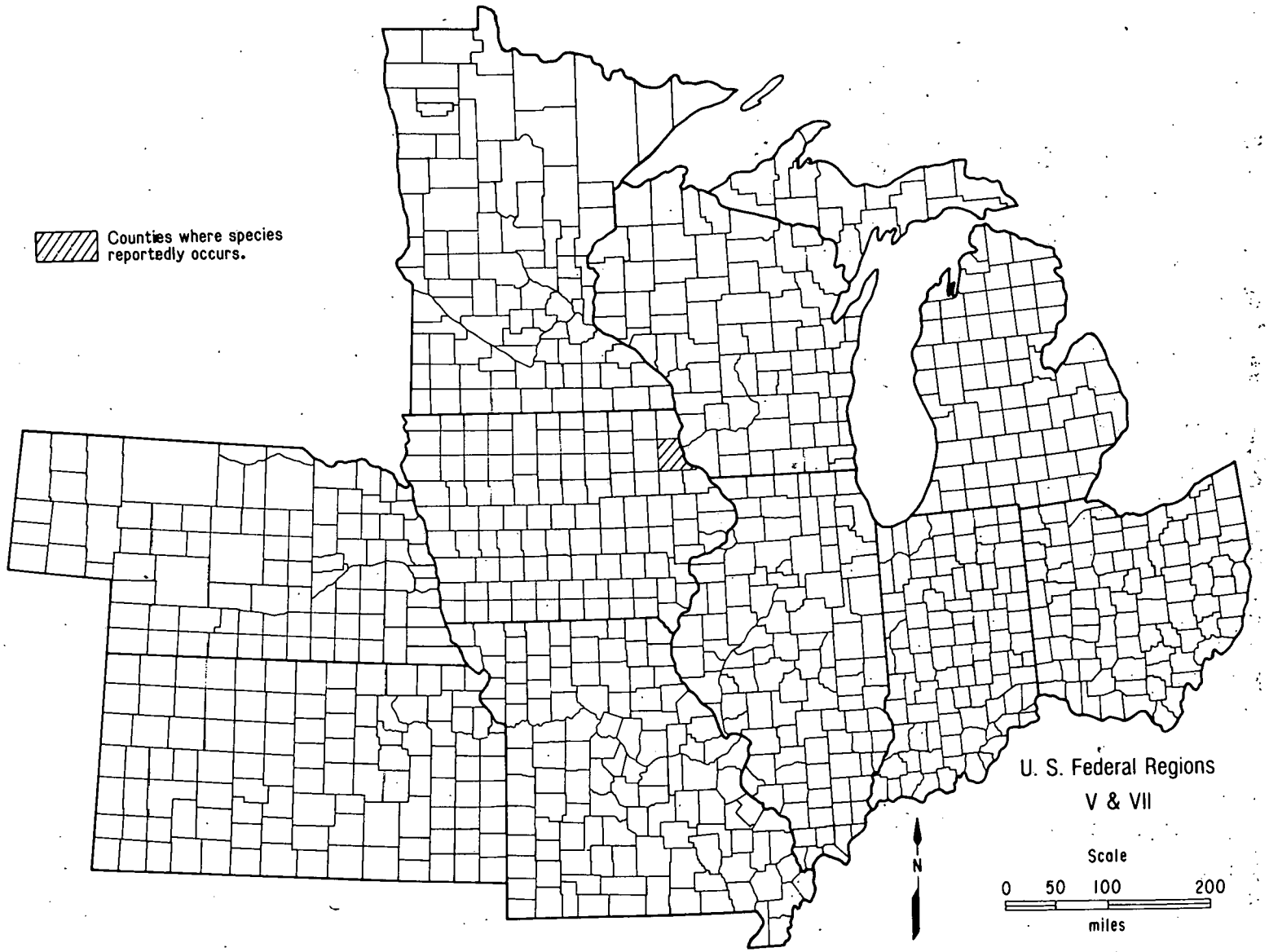

Fig. 14. Iowa Pleistocene Snail Distribution in the Midwest

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2.4.2 Pearly Mussels

Eight species of endangered pearly mussels are found in the Midwest. Descriptions of individul species follow the general discussion below.

Habitat

All of the endangered freshwater mussels of the Midwest are found in rivers. They are limited to certain depths by temperature, dissolved oxygen, and quantity of suspended food particles (Parmalee, 1967). The type of substrate and the presence of specific fishes that serve as hosts for the glochidia (larvae parasitic on the skin, gills, or fins of fish) also restrict distribution. In most cases, however, the species of host fish or fishes is unknown (Baker, 1928).

Reasons for Decline

Similar factors have contributed to the decline of most, if not all, of these endangered freshwater mussels. In addition to chemical and thermal pollution, destruction of habitat, and siltation caused by channelization, dredging, impoundments, and increased agricultural land use have considerably reduced populations. The musseling industry has also been detrimental and, by over-harvesting, has depleted beds in many locations (Parmalee, 1967; Schreiner, 1973).

Studies have shown that dams constructed across rivers alter the current and produce an environment no longer suitable for river-dwelling species. They further restrict distribution by preventing host fish infested with glochidia from ascending the stream or river (Parmalee, 1967).

Management Plans

Extensive surveys should be conducted within the range of each species to locate any unknown populations. In addition, all rivers harboring these endangered mussels should be protected from excessive pollution and siltation, which could further jeopardize survival of these invertebrates.

Table 16. Pearly Mussel Distribution in the Midwest[a]

Species	River	State	Counties[b]	Source
Curtis'	Black	Mo.	Butler, Wayne,	1, 7, 17
			Reynolds	1, 17
	Castor	Mo.	Bollinger	9, 17
Fat Pocketbook	Mississippi	from Minnesota to Missouri		8
	Lower Ohio Drainage	Ill., Ind.		8
	St. Francis	Mo.	Dunklin	1
	Wabash	Ill., Ind.		8
	White	Ind.	Knox, Pike	14
Higgin's Eye	Meramec	Mo.	Crawford, Franklin	1, 7
		Mo.	Gasconade, Phelps, Jefferson, St. Louis, Washington	1
	Minnesota	Minn.	above New Ulm	14
	Mississippi	from the Twin Cities to St. Louis		1
	St. Croix	Minn.	Washington	1
		Wis.	Polk, St. Croix	1
	St. Francis	Mo.	Wayne	7
Orange-footed Pimpleback	Ohio Basin	Ill., Ind.		3
Pink Mucket	Muskingum	Ohio	Licking, Morgan, Muskingum, Washington	1
	Ohio	Ill., Ind., Ohio		8
	Wabash	Ill., Ind.		8
Sampson's	Wabash	Ill.	Crawford, Edwards, Gallatin, Lawrence, Wabash, White	1
		Ind.	Gibson, Knox, Posey, Sullivan	1
Tubercled-blossom	Lower Ohio	Ill.	Gallatin, Hardin, Massac, Pope, Pulaski	1

Table 16. (Cont'd)

Species	River	State	Counties	Source
White Cat's Paw	Detroit	Mich.	Macomb, Wayne	1
	Ohio Drainage	Ill., Ind., Ohio		3
	St. Joseph	Ind.	Allen, DeKalb	1
		Mich.	Hillsdale	1
		Ohio	Defiance, Williams	1

[a]Distribution maps are included with the individual species descriptions.

[b]County names are listed only where they are cited in the literature.

2.4.2.1 Curtis' Pearly Mussel (*Epioblasma (Dysnomia) florentina curtisi*)

Status

This species is endangered (U.S. Fish and Wildlife Service, 1979). Although once thought to be extinct, specimens have recently been taken in Missouri (Raines, 1978).

Former Distribution

Known only from the White River (Missouri) (Utterback, 1916).

Present Distribution

Curtis' pearly mussels have recently been taken in the Black River (Missouri) and Castor River (Missouri) (Schreiner, 1973; L. Visscher, personal communication).

Habitat

This species is found on gravel substrate in rivers with moderate velocity (L. Visscher, personal communication). For further discussion, see Sec. 2.4.2.

Reasons for Decline

Low levels of pollution and channelization are threatening this mussel (Schreiner, 1973) For further discussion, see Sec. 2.4.2.

Management Plans

See Sec. 2.4.2.

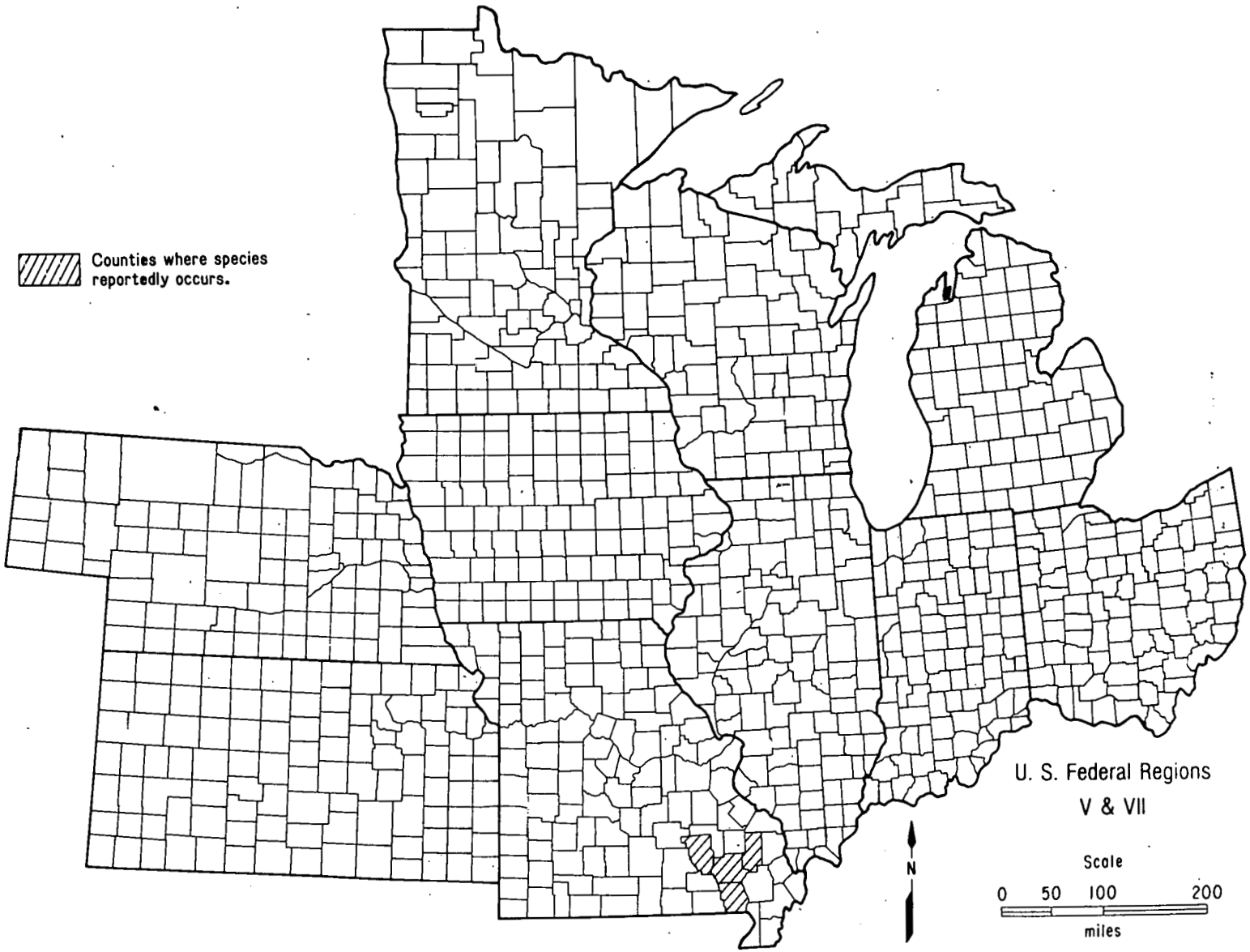

Fig. 15. Curtis' Pearly Mussel Distribution in the Midwest

2.4.2.2 Fat Pocketbook Pearly Mussel (*Potamilus (Proptera) capax*)

Status

This species is endangered (U.S. Fish and Wildlife Service, 1979).

Former Distribution

Unknown.

Present Distribution

This mussel may now be found in the St. Francis River (Arkansas and Missouri), Wabash River (Indiana and Illinois), White River (Arkansas), White River (Indiana), the lower Ohio River drainage, and portions of the Mississippi River from Minnesota to the St. Francis River (Arkansas) (Parmalee, 1967; U.S. Fish and Wildlife Service, 1976, 1977).

Habitat

According to Parmalee (1967), this mussel is a large river species that has been found on both sand and mud substrates at depths of only a few inches to 8 feet or more. He also suggests that flowing water is characteristic of its habitat. For further discussion, see Sec. 2.4.2.

Reasons for Decline

See Sec. 2.4.2.

Management Plans

See Sec. 2.4.2.

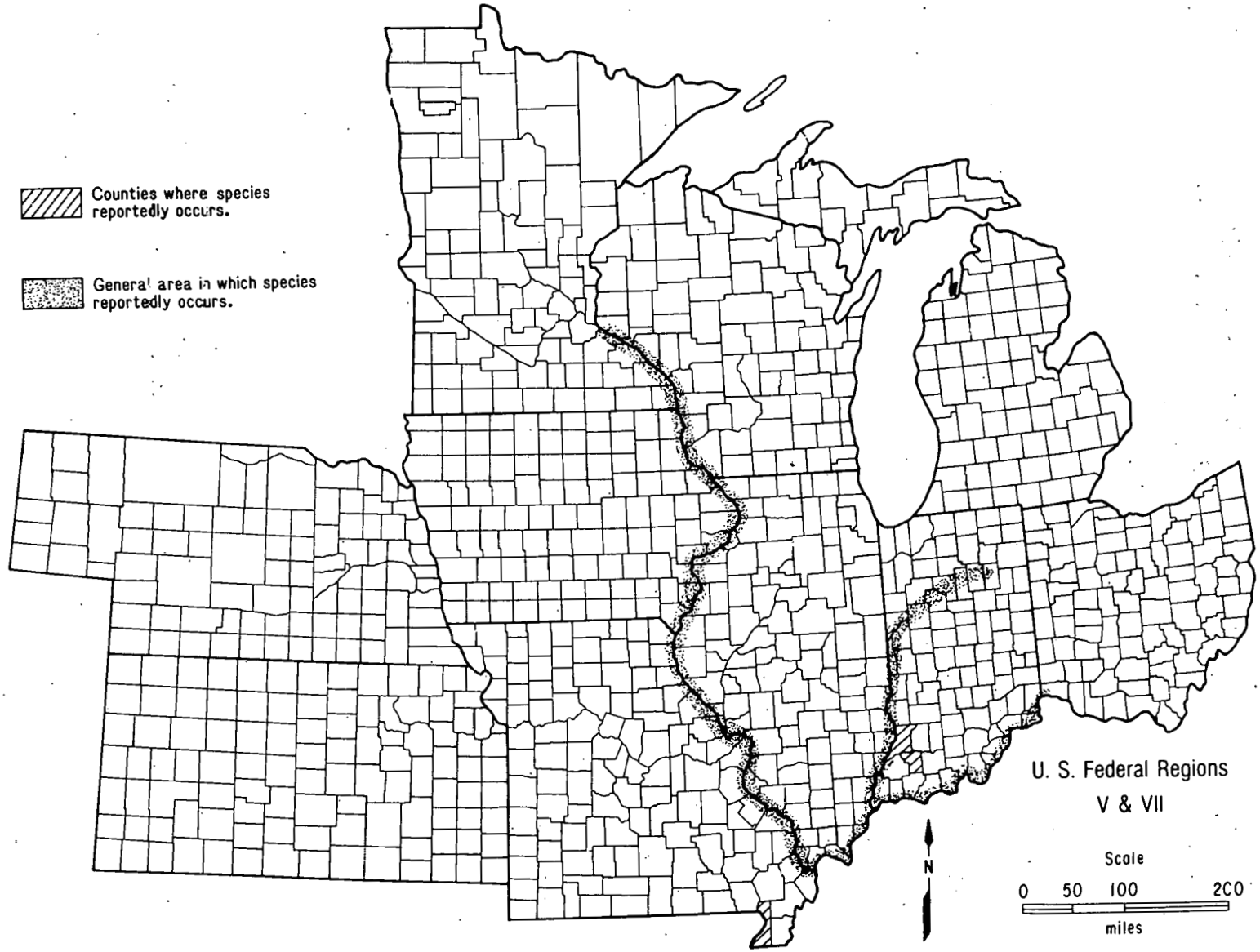

Fig. 16. Fat Pocketbook Pearly Mussel Distribution in the Midwest

2.4.2.3 Higgin's Eye Pearly Mussel (*Lampsilis higginsi*)

Status

This species is endangered (U.S. Fish and Wildlife Service, 1979). Once widely distributed, *L. higginsi* is rare and in imminent danger of extinction. Taxonmists are unsure whether this and *L. orbiculata* (the endangered pink mucket pearly mussel -- see Sec. 2.4.2.5) are distinct species (U.S. Fish and Wildlife Service, 1977).

Former Distribution

L. higginsi was once widely distributed throughout the upper Mississippi River and its larger tributaries. It has been collected in the St. Croix and Mississippi Rivers between Lake St. Croix (Minnesota and Wisconsin) and Cairo, Illinois, as well as in the Minnesota (Minnesota), Iowa, (Iowa), and Illinois (Illinois) Rivers (Baker, 1928; Starrett, 1971; U.S. Fish and Wildlife Service, 1977). It has also been reported from the Black (Arkansas), Elkhorn (Nebraska), Ohio, and White (Arkansas) Rivers (U.S. Fish and Wildlife Service, 1977).

Present Distribution

The present distribution of this mussel is questionable. It has recently been found in the Mississippi River (Illinois, Minnesota, Wisconsin), St. Croix River (Minnesota and Wisconsin), Minnesota River (Minnesota), Meramec River (Missouri) and St. Francis River (Missouri) (Stansberry, 1978; U.S. Fish and Wildlife Service, 1976, 1977; Nordstrom et al., 1977). Its existence within other areas of its former distribution is unknown. Starrett (1971) does mention, however, that *L. higginsi* was gradually eliminated from the Illinois River (Illinois) by pollution and siltation before 1930.

Habitat

Although not definitely known, Baker (1928) and Parmalee (1967) emphasize that this species occurs in large, deep rivers. Baker (1928) reports that the glochidia (larvae) are host-specific for the freshwater drum or sauger(*Stizostedion canadense*). For further discussion, see Sec. 2.4.2.

Reasons for Decline

Imlay (1971) and Starrett (1971) mention that the reasons for decline include pollution, siltation, and substrate destruction. For further discussion, see Sec. 2.4.2.

Management Plans

See Sec. 2.4.2.

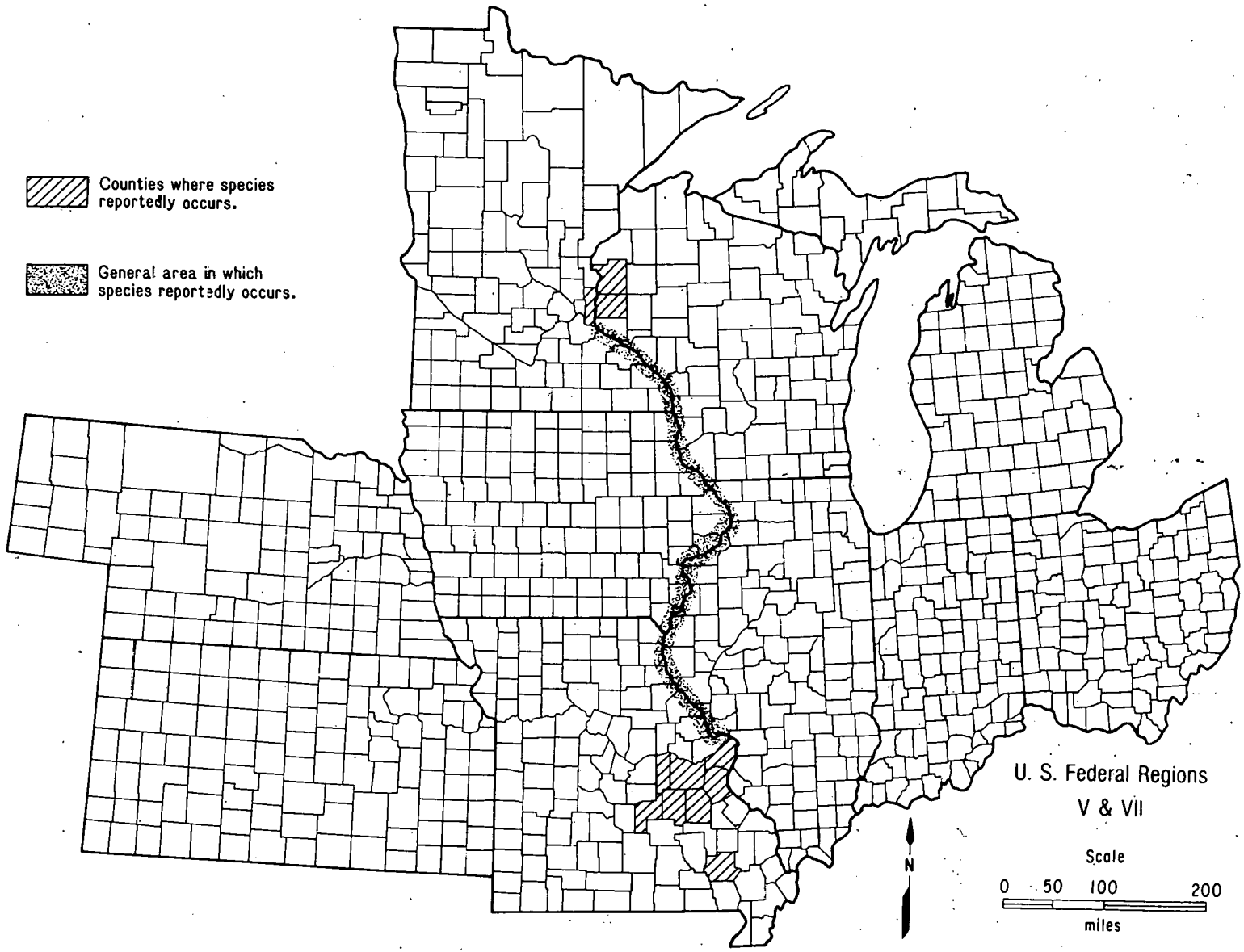

Fig. 17. Higgin's Eye Pearly Mussel Distribution in the Midwest

2.4.2.4 Orange-Footed Pimpleback Pearly Mussel (*Plethobasis cooperianus*)

Status

This species is endangered (U.S. Fish and Wildlife Service, 1979).

Former Distribution

Goodrich and van der Schalie (1944) mention that *P. cooperianus* was confined to the lower Wabash and Ohio Rivers.

Present Distribution

Present distribution includes the Duck River (Tennessee) and Tennessee River (Alabama and Tennessee) (Schreiner, 1973; U.S. Fish and Wildlife Service, 1976). Burch (1973) adds that this species may also be found in the Ohio and Cumberland River basins.

Habitat

See Sec. 2.4.2.

Reasons for Decline

Schreiner (1973) mentions that this species is threatened by impoundments and pollution. For further discussion, see Sec. 2.4.2.

Management Plans

See Sec. 2.4.2.

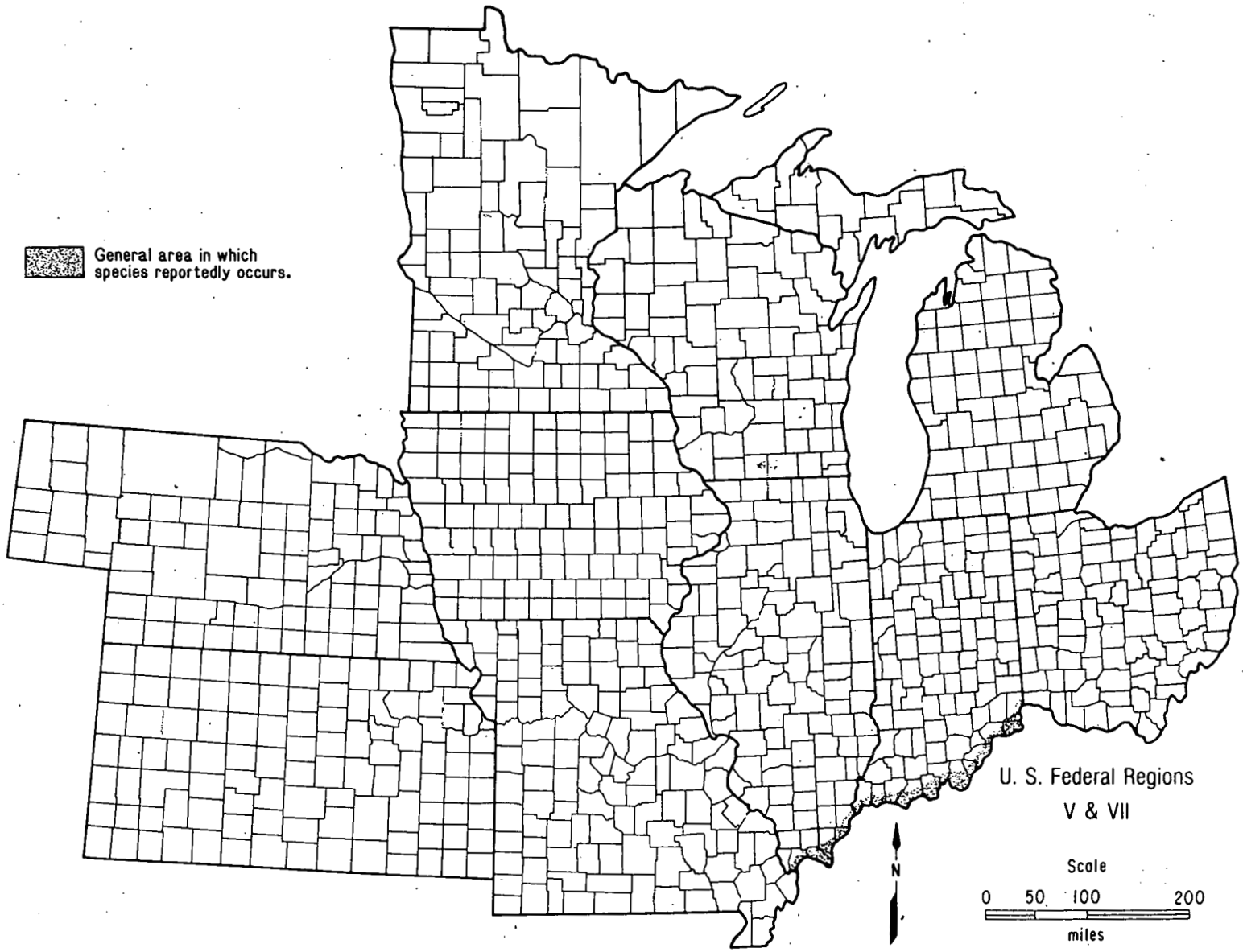

Fig. 18. Orange-Footed Pimpleback Pearly Mussel Distribution in the Midwest

2.4.2.5 Pink Mucket Pearly Mussel (*Lampsilis orbiculata orbiculata*)

Status

This species is endangered (U.S. Fish and Wildlife Service, 1979). Uncommon to rare in Illinois (Parmalee, 1967). Although *L. orbiculata* and *L. higginsi* (the endangered Higgin's eye pearly mussel -- see Sec. 2.4.2.3) are distinguishable, they may be conspecific (Starrett, 1971).

Former Distribution

This species was once found in the Wabash River near New Harmony (Posey County), Indiana (Goodrich and van der Schalie, 1944). Prior to 1930, it was also found in the Illinois River (Illinois) (Starrett, 1971).

Present Distribution

The U.S. Fish and Wildlife Service (1976) lists *L. orbiculata* as occurring in the Green River (Kentucky), Kanawha River (West Virginia), Muskingam River (Ohio), and Tennessee River (Alabama and Tennessee). It may also be found in the Cumberland River (Kentucky and Tennessee), lower Wabash River (Illinois and Indiana), and the Ohio River (Parmalee, 1967). Its occurrence in the Illinois River (Illinois) is doubtful.

Habitat

In Illinois, this species was limited to large rivers and usually taken in deep water (Parmalee, 1967). The host fish for the parasitic glochidia (larvae) may be the freshwater drum or sauger (*Stizostedion canadense*) (U.S. Fish and Wildlife Service, 1977).

Reasons for Decline

See Sec. 2.4.2.

Management Plans

See Sec. 2.4.2.

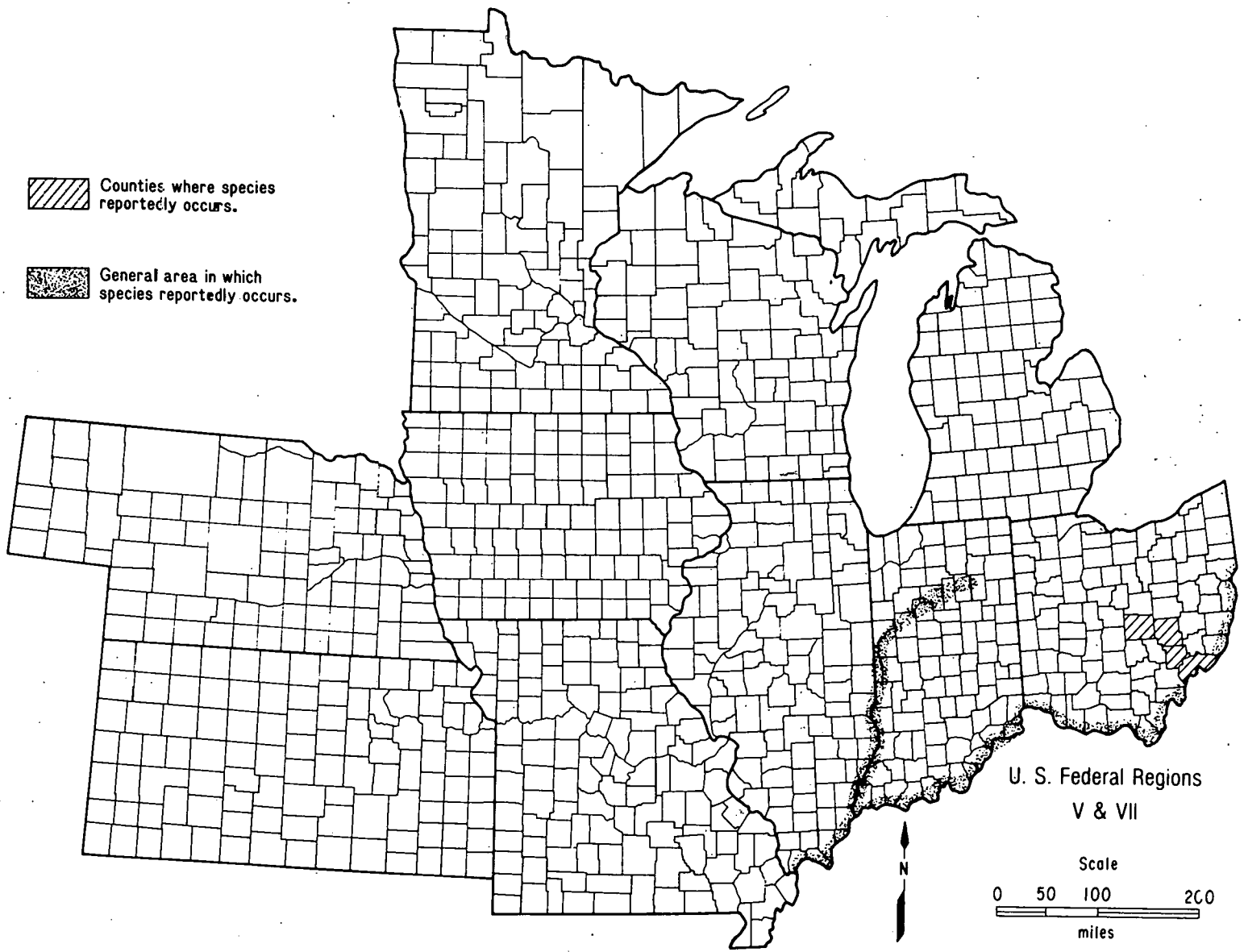

Fig. 19. Pink Mucket Pearly Mussel Distribution in the Midwest

2.4.2.6 Sampson's Pearly Mussel (*Epioblasma (Dysnomia) sampsoni*)

Status

This species is endangered (U.S. Fish and Wildlife Service, 1979). Many experts believe that this species may be extinct. Others feel that it may be a large river form or variant of *Dysnomia perplexa* (a nonendangered species).

Former Distribution

Archaeological excavations have revealed several similar valves indicating prehistoric distribution. These were discovered at the "Little Chains" site (White County), Illinois (Parmalee, 1967). More recently, shells have been found near New Harmony (Posey County), Indiana (Goodrich and van der Schalie, 1944).

Present Distribution

This mussel is known only from the Wabash River (Illinois and Indiana) (Clark, 1975; Schreiner, 1973).

Habitat

See Sec. 2.4.2.

Reasons for Decline

Pollution, channelization, impoundments, and navigation operations are threatening this species (Schreiner, 1973). For further discussion, see Sec. 2.4.2.

Management Plans

See Sec. 2.4.2.

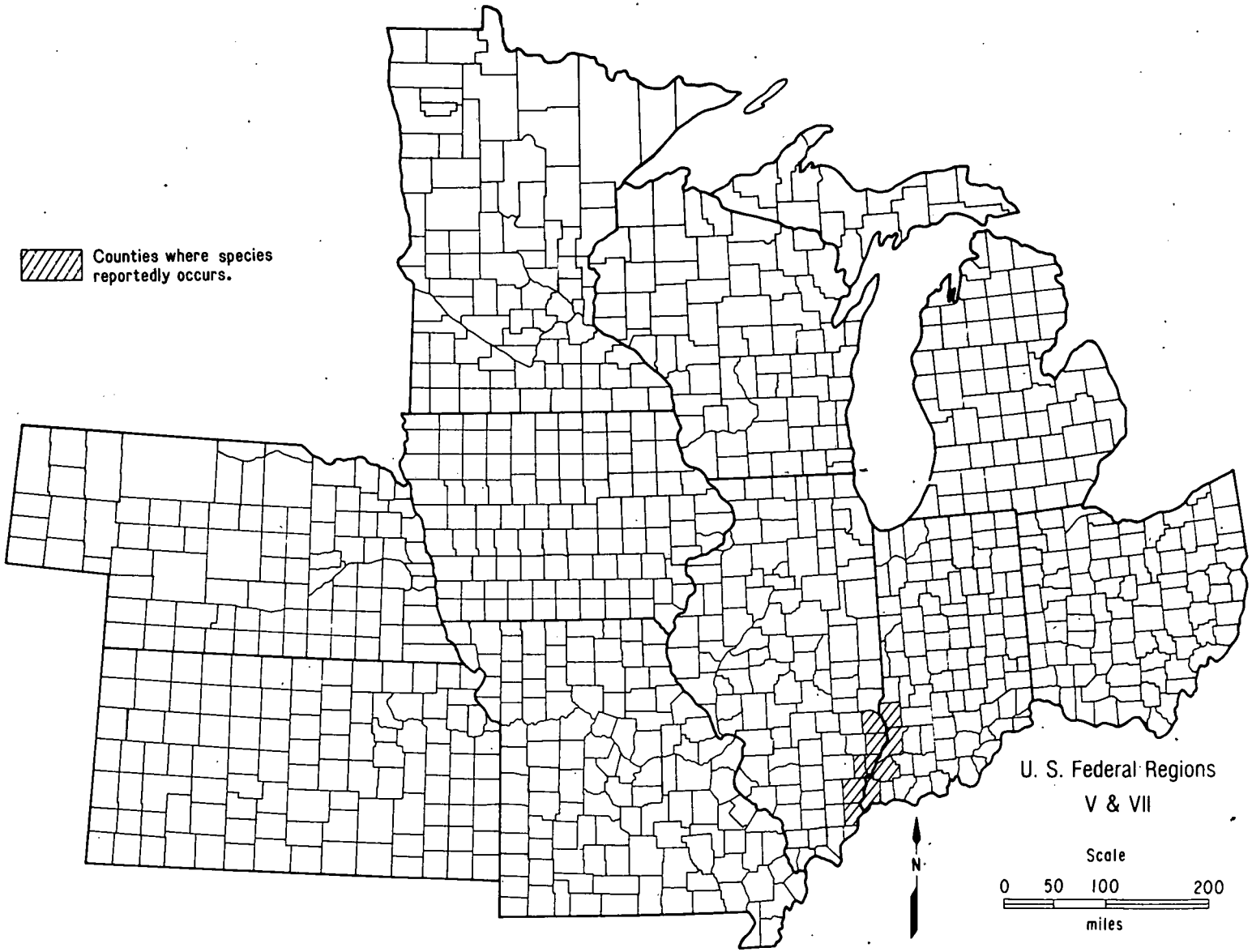

Fig. 20. Sampson's Pearly Mussel Distribution in the Midwest

2.4.2.7 Tubercled-Blossom Pearly Mussel (*Epioblasma (Dysnomia) torulosa torulosa*)

Status

This species is endangered (U.S. Fish and Wildlife Service, 1979).

Former Distribution

Goodrich and van der Schalie (1944) indicate that this mollusk has been found in the Wabash River near Lafayette (Tippecanoe County) and New Harmony (Posey County), Indiana.

Present Distribution

This mussel inhabits the lower Ohio River (Kentucky and Illinois), Kanawha River (West Virginia), and Nolichucky River (Tennessee) (U.S. Fish and Wildlife Service, 1976). It is not known whether this species still exists in the Wabash River (Indiana).

Habitat

See Sec. 2.4.2.

Reasons for Decline

See Sec. 2.4.2.

Management Plans

See Sec. 2.4.2.

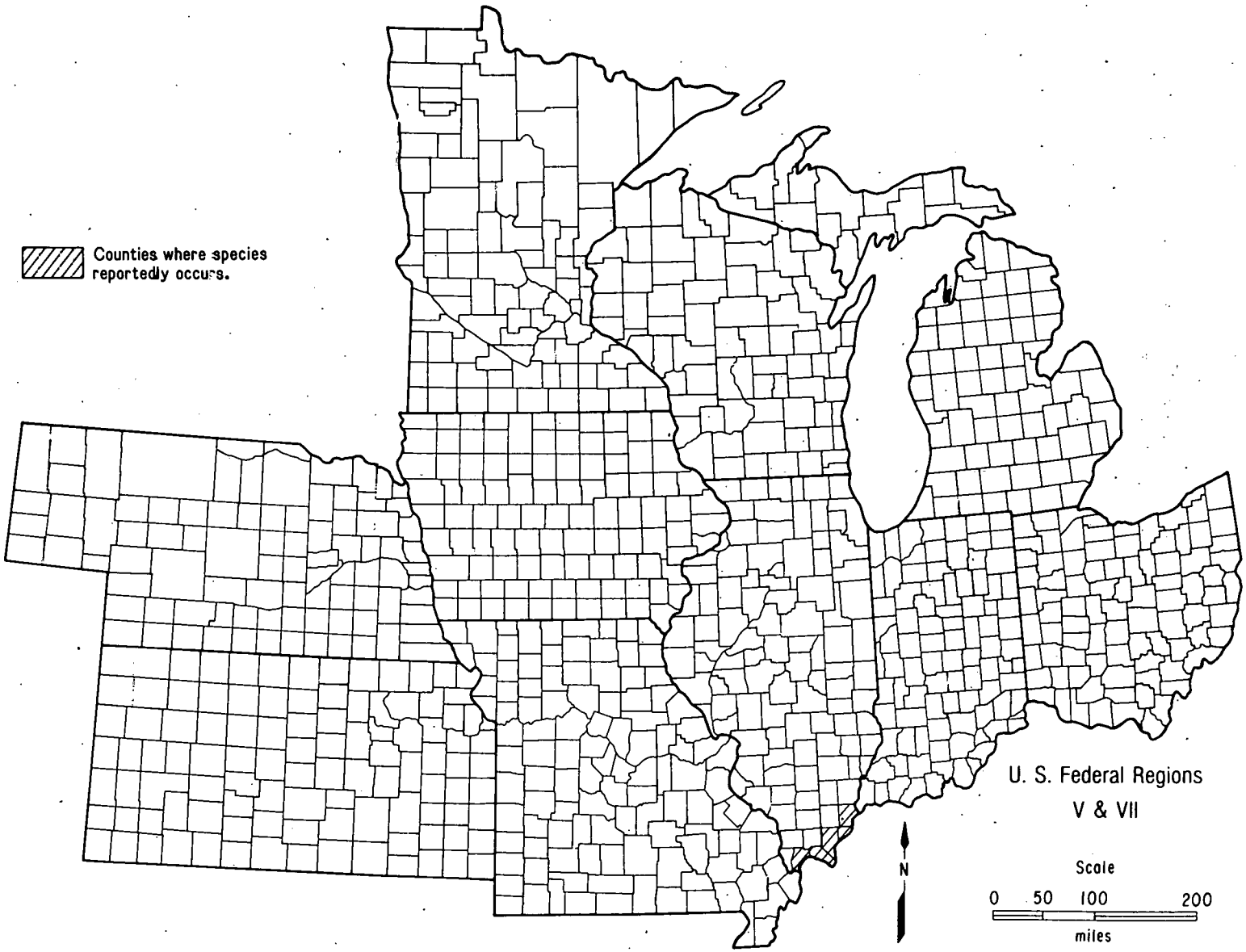

Fig. 21. Tubercled-Blossom Pearly Mussel Distribution in the Midwest

2.4.2.8 White Cat's Paw Pearly Mussel (*Epioblasma (Dysnomia) sulcata delicata*)

Status

This species is endangered (U.S. Fish and Wildlife Service, 1979). The State of Michigan believes that this mollusk is possibly extinct (U.S. Fish and Wildlife Service, 1976).

Former Distribution

Goodrich and van der Schalie (1944) point out that this mussel has been found in Wabash River near Lafayette (Tippecanoe County) and New Harmony (Posey County), Indiana.

Present Distribution

The Detroit (Michigan) and St. Joseph (Indiana, Michigan, and Ohio) Rivers harbor populations of *E.s. delicata* (U.S. Fish and Wildlife Service, 1976). Burch (1973) adds that it may be found in the Ohio River drainage. It is not known whether it may still be found in the Wabash River (Illinois and Indiana).

Habitat

See Sec. 2.4.2.

Reasons for Decline

This pearly mussel is threatened by pollution, dredging, and channelization (Schreiner, 1973). For further discussion, see Sec. 2.4.2.

Management Plans

See Sec. 2.4.2.

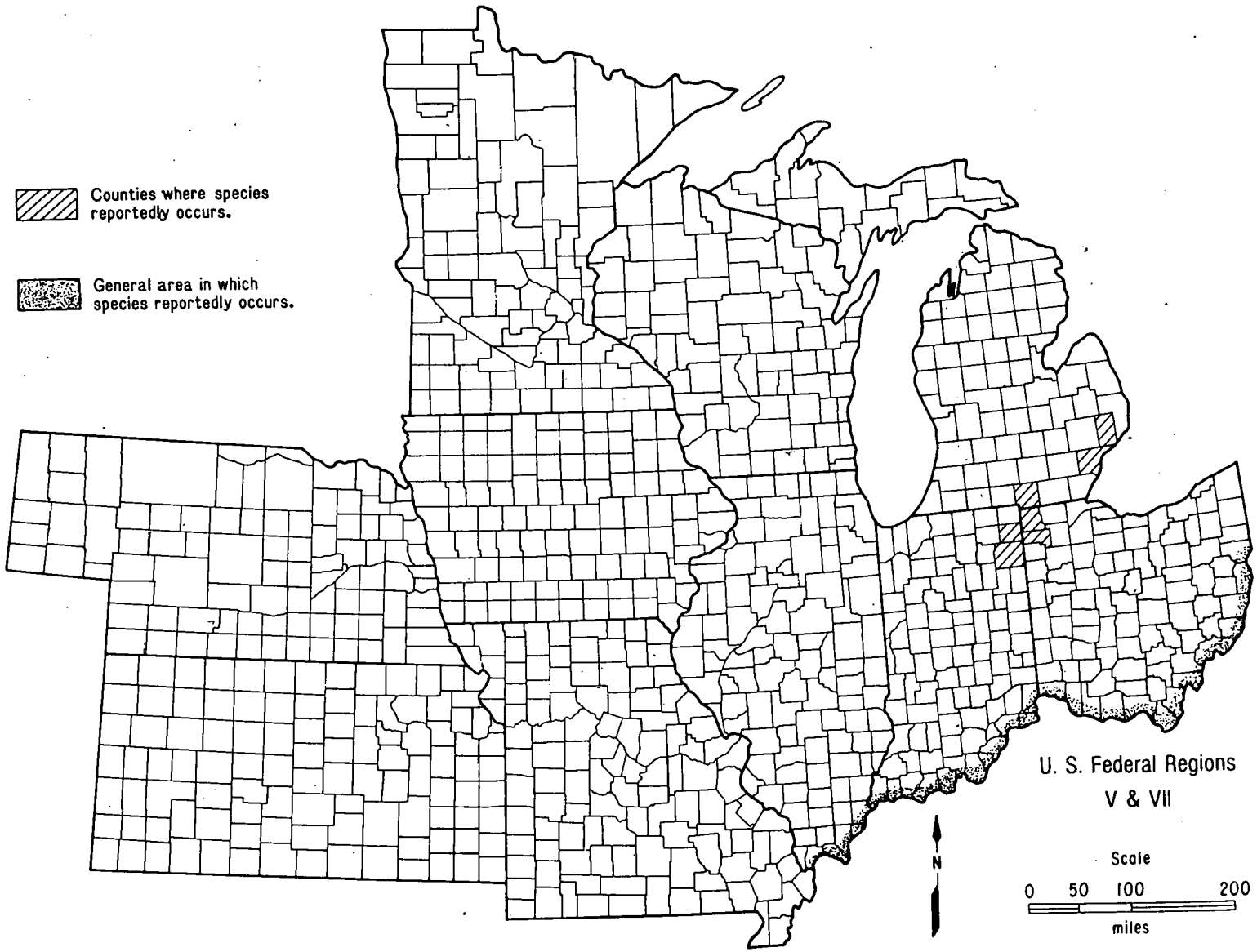

Fig. 22. White Cat's Paw Pearly Mussel Distribution in the Midwest

LITERATURE CITED

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LITERATURE CITED (Cont'd)

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APPENDIX A

Authorities on Endangered Species

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Federal Agencies

Anderson, Maurice
U.S. Fish and Wildlife Service
Area Office: South Dakota-Nebraska
Post Office Box 250
Pierre, South Dakota 57501
605-224-8692
*Whooping Crane Migration Monitoring Program

Bogan, Michael
U.S. Fish and Wildlife Service
Washington, D.C. 20240
202-381-5161
*Species accounts for eastern cougar, Kirtland's warbler, swift fox, and American peregrine falcon

Christman, Steve
U.S. Fish and Wildlife Service
National Fish and Wildlife Laboratory - Gainesville Station
412 N.E. 16th Ave. - Room 250
Gainesville, Florida 32601
904-372-2571
*Species accounts for whooping crane, gray wolf, Indiana/gray bats and Southern bald eagle

Engel, James
Endangered Species Office
U.S. Fish and Wildlife Service
Twin Cities, Minnesota 55111
612-725-3596
*Senior Staff Biologist - Endangered species - Authority on Indiana bats

Erickson, Ray
Assistant Director
Patuxent Wildlife Research Center
Laurel, Maryland 20810
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*Authority on whooping cranes

Hillman, Conrad
U.S. Fish and Wildlife Service
Patuxent Wildlife Research Center
Laurel, Maryland 20811
301-776-4880
*Authority on black-footed ferrets

Imlay, Marc
U.S. Fish and Wildlife Service
Department of Interior
Columbia National Fisheries Research Lab.
Route 1
Columbia, Missouri 65201
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*Authority on mussels

Jobman, Wallace
U.S. Fish and Wildlife Service
Area Office: South Dakota-Nebraska
Post Office Box 250
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Endangered Species Office
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*Staff Wildlife Biologist

Jones, Marshall
Office of Endangered Species
U.S. Fish and Wildlife Service
Washington, D.C. 20240
703-235-2760

Kuyt, Ernie
Canadian Wildlife Service
9942 108th Street
Edmonton, Alberta, Canada T5K 2JS
403-425-6860
*Authority on whooping cranes

Mech, L. David
U.S. Fish and Wildlife Service
North Central Forest Experiment Station
1992 Folwell Ave.
St. Paul, Minnesota 55101
612-645-0841
*Authority on gray wolves

Office of Endangered Species
U.S. Fish and Wildlife Service
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Federal Agencies (Cont'd)

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*Whooping crane recovery team leader

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State Agencies

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State Agencies (Cont'd)

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305-852-5092
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*Authority on Indiana and gray bats

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APPENDIX B

State Endangered Species Lists

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The following lists of organisms have been obtained from appropriate state agencies. Some species included in these lists are considered to be in danger within the respective state, though not necessarily within the nation as a whole. Their inclusion, however, strengthens the federal endangered species list.

An asterisk (*) by the name of a species indicates that it is also included in the federal list. There are some federally-endangered species (for instance, the Bachman's warbler in Illinois) that are included on state lists but are not described in this report. In those cases no other sources could be found to verify that the species still occurred in the Midwest.

ILLINOIS

MAMMALS

Endangered

*Gray Bat	*Myotis grisescens*
*Indiana Bat	*Myotis sodalis*
Eastern Wood Rat	*Neotoma floridana*
White-Tailed Jackrabbit	*Lepus townsendii*

Threatened

River Otter	*Lutra canadensis*
Bobcat	*Lynx rufus*
Golden Mouse	*Ochrotomys nuttalli*
Rice Rat	*Oryzomys palustris*

BIRDS

Endangered

Double-Crested Cormorant	*Phalacrocorax auritus*
Snowy Egret	*Egretta thula*
Great Egret	*Casmerodius albus*
Little Blue Heron	*Florida caerulea*
American Bittern	*Botaurus lentiginosus*
Black-Crowned Night Heron	*Nycticorax nycticorax*
Mississippi Kite	*Ictinia mississippiensis*
Cooper's Hawk	*Accipiter cooperii*
Red-Shouldered Hawk	*Buteo lineatus*
Swainson's Hawk	*Buteo swainsoni*
*Bald Eagle	*Haliaeetus leucocephalus*
Osprey	*Pandion haliaetus*
Marsh Hawk	*Circus cyaneus*
*Peregrine Falcon	*Falco peregrinus*
Greater Prairie Chicken	*Tympanuchus cupido*
Yellow Rail	*Coturnicops noveboracensis*
Black Rail	*Laterallus jamaicensis*
Purple Gallinule	*Prophyrula martinica*
Piping Plover	*Charadrius melodus*
*Eskimo Curlew	*Numenius borealis*

ILLINOIS (Cont'd)

BIRDS (Cont'd)

Endangered

Upland Sandpiper	*Bartramia longicauda*
Wilson's Phalarope	*Steganopus tricolor*
Forster's Tern	*Sterna forsteri*
Common Tern	*Sterna hirundo*
Least Tern	*Sterna albifrons*
Black Tern	*Chlidonias niger*
Barn Owl	*Tyto alba*
Long-Eared Owl	*Asio otus*
Short-Eared Owl	*Asio flammmeus*
Brown Creeper	*Certhia familiaris*
*Bachman's Warbler	*Vermivora bachmanii*
Yellow-Headed blackbird	*Xanthocephalus xanthocephalus*
Bachman's Sparrow	*Aimophila aestivalis*

Threatened

Common Gallinule	*Gallinula chloropus*
Bewick's Wren	*Thryomanes bewickii*
Veery	*Catharus fuscescens*
Loggerhead Shrike	*Lanius ludovicianus*
Swainson's Warbler	*Limnothlypis swainsonii*
Brewer's Blackbird	*Euphagus cyanocephalus*
Henslow's Sparrow	*Ammodramus henslowii*

FISHES

Endangered

Bigeye Chub	*Hybopsis amblops*
Bluebreast Darter	*Etheostoma camurum*
Bluehead Shiner	*Notropsis hubbsi*
Harlequin Darter	*Etheostoma histrio*
*Longjaw Cisco	*Coregonus alpenae*

Threatened

Cisco	*Coregonus artedii*
Longnose Sucker	*Catostomus catostomus*
Alligator Gar	*Lepisosteus spatula*
Pugnose Shiner	*Notropis anogenus*
Blacknose Shiner	*Notropis heterolepis*
Bantam Sunfish	*Lepomis symmetricus*
Lake Whitefish	*Coregonus clupeaformis*
Lake Sturgeon	*Acipenser fulvescens*

ILLINOIS (Cont'd)

AMPHIBIANS AND REPTILES

Endangered

Dusky Salamander	*Desmognathus fuscus*
Silvery Salamander	*Ambystoma platineum*
Spotted Turtle	*Clemmys guttata*
Slider	*Pseudemys floridana x concinna*
Illinois Mud Turtle	*Kinosternon flavescens*
Broad-Banded Watersnake	*Nerodia fasciata*
Eastern Ribbon Snake	*Thamnophis sauritus*

Threatened

Illinois Chorus Frog	*Pseudacris streckeri*
Western Hog-Nosed Snake	*Heterodon nasicus*
Whip Snake	*Masticophis flagellum*
Great Plains Rat Snake	*Elaphe guttata*

INDIANA

MAMMALS

Endangered

Bobcat	*Lynx rufus*
Badger	*Taxidea taxus*
Otter	*Lutra canadensis*
*Indiana Bat	*Myotis sodalis*
*Gray Bat	*Myotis grisescens*
Southeastern Myotis	*Myotis austroriparius*
Big-Eared Bat	*Plecotus rafinesquii*
*Eastern Timber Wolf	*Canis lupus lycaon*

Proposed

Swamp Rabbit	*Sylvilagus aquaticus*
Star-Nosed Mole	*Condylura cristata*
Plains Pocket Gopher	*Geomys bursarius*
Eastern Wood Rat	*Neotoma floridana*
Western Harvest Mouse	*Reithrodontomys megalotis*
Franklin's Ground Squirrel	*Spermophilus franklini*

INDIANA (Cont'd)

BIRDS

Endangered

*American Peregrine Falcon	*Falco peregrinus anatum*
*Arctic Peregrine Falcon	*Falco peregrinus tundrius*
*Kirtland's Warbler	*Dendroica kirtlandii*
*Bald Eagle	*Haliaeetus leucocephalus*

FISH

Endangered

*Longjaw Cisco	*Coregonus alpenae*

Proposed

Eastern Sand Darter	*Ammocrypta pellucida*
Spring Cavefish	*Chologaster agassizi*
Northern Cavefish	*Amblyopsis spelaea*
Silverband Shiner	*Notropis shumardi*
Ribbon Shiner	*Notropis fumeus*
Popeye Shiner	*Notropis ariommus*
Crystal Darter	*Ammocrypta asprella*
Stargazing Darter	*Percina uranidea*
Gilt Darter	*Percina evides*
Spotted Darter	*Etheostoma maculatum*
Harlequin Darter	*Etheostoma histrio*
Tippecanoe Darter	*Etheostoma tippecanoe*
Spottail Darter	*Etheostoma squamiceps*
Redside Dace	*Clinostomus elongatus*
Rosefin Shiner	*Notropis ardens*
Swamp Darter	*Etheostoma swaini*
Blue Sucker	*Cycleptus elongatus*
Ohio River Muskellunge	*Esox masquinongy ohioensis*
Bluebreast Darter	*Etheostoma camurum*
Variegated Darter	*Etheostoma variatum*

REPTILES

Proposed

Eastern Mud Turtle	*Kinosternon s. subrubrum*
Spotted Turtle	*Clemmys guttata*
Hieroglyphic Turtle	*Pseudemys concinna hieroglyphica*
Northern Copperbelly	*Natrix erythrogaster neglecta*
Butler's Garter Snake	*Thamnophis butleri*

INDIANA (Cont'd)

REPTILES (Cont'd)

Proposed

Smooth Green Snake	*Opheodrys vernalis blanchardi*
Scarlet Snake	*Cemophora coccinea copei*
Eastern Massasauga	*Sistrurus c. catenatus*

AMPHIBIANS

Proposed

Hellbender	*Cryptobranchus a. alleganiensis*
Silvery Salamander	*Ambystoma platineum*
Four-Toed Salamander	*Hemidactylium scutatum*
Northern Red Salamander	*Pseudotriton r. ruber*
Illinois Chorus Frog	*Pseudaoris streckeri illinoensis*

MOLLUSKS

Endangered

*Fat Pocketbook Pearly Mussel	*Potamilus capax*
*Orange-Footed Pimpleback Mussel	*Plethobasis cooperianus*
*Pink Mucket Pearly Mussel	*Lampsilis orbiculata orbiculata*
*Rough Pigtoe Pearly Mussel	*Pleurobema plenum*
*Sampson's Pearly Mussel	*Epioblasma sampsoni*
*Tubercled-Blossom Pearly Mussel	*Epioblasma torulosa torulosa*
*White Cat's Paw Pearly Mussel	*Epioblasma sulcata delicata*
*White Wartyback Pearly Mussel	*Plethobasis cicatricosus*

Proposed

Deers Toe	*Truncilla truncata*
Black Sand Shell	*Ligumia recta*
Snuffbox	*Dysonomia triquetra*
	Carunculina parva
	Carunculina glans
	Actinonaias ellipsiformis

CRUSTACEANS

Proposed

Troglobitic Crayfish	*Orconectes inermis testii*

INDIANA (Cont'd)

CRUSTACEANS (Cont'd)

Proposed

Ostracods commensal with O. i. testii	*Orconectes inermis testii - Sagittocythere barri*
Troglobitic Crayfish	*Orconectes inermis inermis*
Ostracods commensal with O. i. inermis	*Orconectes inermis inermis - Sagittocythere barri*
Burrowing Crayfish	*Cambarus ortmanni*
Crayfish	*Cambarus robustus*
Crayfish	*Orconectes indianensis slanii, Orconectes juvenilis*
Conchostracan	*Lynceus brachyurus*
Cave Isopod	*Asellus styaia*
Jordan Cave Isopod	*Asellus jordani*
Big White Amphipod	*Crangonyx gracilis*

IOWA

MAMMALS

Endangered

*Indiana Bat	*Myotis sodalis*
Plains Pocket Mouse	*Perognathus flavescens*
Grasshopper Mouse	*Onychomys leucogaster*
Red-Backed Vole	*Clethrionomys gapperi*
Woodland Vole	*Microtis pinetorum*
Black Bear	*Ursus americana*
Bobcat	*Lynx rufus*

Threatened

Keene's Bat	*Myotis keenii*
Evening Bat	*Nycticeius humeralis*
River Otter	*Lutra canadensis*

BIRDS

Endangered

Red-Shouldered Hawk	*Buteo lineatus*
Northern Harrier	*Circus cyaneus*
*Peregrine Falcon	*Falco peregrinus*
Piping Plover	*Charadrius melodus*
Upland Sandpiper	*Bartramia longicauda*

IOWA (Cont'd)

BIRDS

Endangered

Barn Owl	*Tyto alba*
Burrowing Owl	*Speotyto cunicularia*
Least Tern	*Sterna albifrons*

Threatened

Eared Grebe	*Podiceps caspicus*
Cooper's Hawk	*Accipiter cooperi*
Broad-Winged Hawk	*Buteo platypterus*
Long-Eared Owl	*Asio otus*
Say's Phoebe	*Sayornis saya*
Loggerhead Shrike	*Lanius ludovicianus*
Blue-Winged Warbler	*Vermivora pinus*

FISHES

Endangered

Lake Sturgeon	*Acipenser fulvescens*
Pallid Sturgeon	*Scaphirhynchus albus*
Sicklefin Chub	*Hybopsis meeki*
Lake Chub	*Couesius plumbeus*
Blacknose Shiner	*Notropis heterolepis*
Silverband Shiner	*Notropis shumardi*
Pearl Dace	*Somotilus margarita*
Black Redhorse	*Moxostoma dugesnei*
Starhead Topminnow	*Fundulus notti*
Plains Topminnow	*Fundulus sciadicus*
Longear Sunfish	*Lepomis megalotis*
Least Darter	*Etheostoma microperca*
Orangethroat Darter	*Etheostoma spectabile*

Threatened

Chestnut Lamprey	*Ichthyomyzon castaneus*
American Brook Lamprey	*Lampetra lamottei*
Skipjack Herring	*Alosa chrysochloris*
Grass Pickerel	*Esox americanus vermiculatus*
Gravel Chub	*Hybopsis x. punctata*
Pugnose Shiner	*Notropis anogenus*
Weed Shiner	*Notropis texanus*
Topeka Shiner	*Notropis topeka*
Western Sand Darter	*Ammocrypta clara*

IOWA (Cont'd)

FISHES (Cont'd)

Threatened

Mud Darter	*Etheostoma asprigene*
Bluntnose Darter	*Etheostoma chlorosomum*

REPTILES AND AMPHIBIANS

Endangered

Great Plains Skink	*Eumeces obsoletus*
Western Slender Glass Lizard	*Ophiosaurus attenuatus*
Speckled Kingsnake	*Lampropeltis getulus*
Northern Copperhead	*Agkistrodon contortrix*
Prairie Rattlesnake	*Crotalus viridis*
Blue-Spotted Salamander	*Ambystoma laterale*
Central Newt	*Notophthalmus viridescens*
Illinois Mud Turtle	*Kinosternon flavescens spooneri*
Wood Turtle	*Clemmys insculpta*

Threatened

Stinkpot	*Sternotherus odoratus*
Ornate Box Turtle	*Terrapene ornata*
Red-Eared Turtle	*Chrysemys scripta*
Blanding's Turtle	*Emydoidea blandingi*
Five-Lined Skink	*Eumeces fasciatus*
Diamondback Water Snake	*Natrix rhombifera*
Yellow-Bellied Water Snake	*Natrix erythrogaster*
Graham's Water Snake	*Natrix grahami*
Western Earth Snake	*Virginia valeriae*
Black Rat Snake	*Elaphe obsoleta*
Massasauga	*Sistrurus catentatus*
Small-Mouthed Salamander	*Ambystoma texanum*
Western Spadefoot	*Scaphiopus bombifrons*
Spring Peeper	*Hyla crucifer*

KANSAS

MAMMALS

Endangered

*Black-Footed Ferret	*Mustela nigripes*
*Gray Bat	*Myotis grisescens*

KANSAS (Cont'd)

BIRDS

Endangered

*Peregrine Falcon	*Falco peregrinus anatum*
*Whooping Crane	*Grus americana*
*Eskimo Curlew	*Numenius borealis*
*Bald Eagle	*Haliaeetus leucocephalus*

Threatened

Prairie Falcon	*Falco mexicanus*
Least Tern	*Sterna albifrons*

FISHES

Endangered

Neosho Madtom	*Noturus placidus*
Pallid Sturgeon	*Scaphirhynchus albus*
Sicklefin Chub	*Hybopsis meeki*

Threatened

Blue Sucker	*Cycleptus elongatus*
Arkansas Darter	*Estheastoma cragini*
Topeka Shiner	*Notropis topeka*

REPTILES AND AMPHIBIANS

Endangered

Central Newt	*Notophthalmus viridescens louisianensis*
Grotto Salamander	*Typhlotriton spelaeus*
Gray-Bellied Salamander	*Eurycea multiplicata griseogaster*
Cave Salamander	*Eurycea lucifuga*

Threatened

Alligator Snapping Turtle	*Macroclemys temmincki*
Northern Crawfish Frog	*Rana areolata circulosa*

KANSAS (Cont'd)

INVERTEBRATES

Endangered

	Pomatiopsis lapidaria
Warty-Backed Mussel	*Quadrula nodulata*
Heel-Splitter Mussel	*Anodonta suborbiculata*
*Fat Pocketbook Pearly Mussel	*Proptera capax*

Threatened

Riffle Beetle	*Dubiraphia n. sp.*
Riffle Beetle	*Optioservus n. sp.*

MICHIGAN

MAMMALS

Endangered

*Indiana Bat	*Myotis sodalis*
*Gray Wolf	*Canis lupus*

Threatened

Pigmy Shrew	*Microsorex hoyi thompsoni*
Marten	*Martes americana*
Southern Bog Lemming	*Synatomys cooperi*

BIRDS

Endangered

*Peregrine Falcon	*Falco peregrinus*
*Kirtland's Warbler	*Dendroica kirtlandii*
Double-Crested Cormorant	*Phalacrocorax auritus*
Common Tern	*Sterna hirundo*

Threatened

Cooper's Hawk	*Accipiter cooperi*
Red-Shouldered Hawk	*Buteo lineatus*
*Bald Eagle	*Haliaeetus leucocephalus*
Marsh Hawk	*Circus cyaneus*

MICHIGAN (Cont'd)

BIRDS (Cont'd)

Threatened

Osprey	*Pandion haliaetus*
Greater Prairie Chicken	*Tympanuchus cupido*
Piping Plover	*Charadrius melodus*
Barn Owl	*Tyto alba*
Loggerhead Shrike	*Lanius ludovicianus*
Caspian Tern	*Hydroprogne caspia*

FISHES

Endangered

*Longjaw Cisco	*Coregonus alpenae*
Deepwater Cisco	*Coregonus johannae*
Blackfin Cisco	*Coregonus nigripinnis*
Shortnose Cisco	*Coregonus reighardi*
Shortjaw Cisco	*Coregonus zenithicus*
*Blue Pike	*Stizostedion vitreum glaucum*
Northern Madtom	*Noturus stigmosus*

Threatened

Lake Sturgeon	*Acipenser fulvescens*
Cisco or Lake Herring	*Coregonus artedii*
Bloater	*Coregonus hoyi*
Kiyi	*Coregonus kiyi*
Silver Shiner	*Notropis photogenis*
Redside Dace	*Clinostomus elongatus*
River Redhorse	*Moxostoma carinatum*
Eastern Sand Darter	*Ammocrypta pellucida*
Southern Redbelly Dace	*Thoxinus erythrogaster*
Bigeye Chub	*Hybopsis amblops*
Creek Chub Sucker	*Erimyzon oblongus*

REPTILES

Endangered

Kirtland's Water Snake	*Clonophis kirtlandi*

Threatened

Black Rat Snake	*Elaphe obsoleta obsoleta*
Northern Copperbelly	*Nerodia erythrogaster neglecta*

MICHIGAN (Cont'd)

REPTILES (Cont'd)

Threatened

Eastern Fox Snake	*Elaphe vulpina gloydi*
Eastern Box Turtle	*Terrapene carolina carolina*

MUSSELS

Endangered

Simpsoniconcha ambigua
Obovaria leibii

Threatened

Pleurobema clava
Elliptio complanatus
Cyclonaias tuberculata
Anodonta subgibbosa
Actinonaias ellipsiformis
Lampsilis fasciola
Dysnomia triquetra

SNAILS

Threatened

Bulimnea megasoma
Pomatiopsis cincinnatiensis
Fontigens nickliniana
Probythinella lacustris
Zoogenetes harpa
Mesodon sayanus
Mesodon elevatus
Triodopsis denotata
Anguispira kochi
Mesomphix cupreus
Haplotrema concavum
Discus patulus

MINNESOTA (Cont'd)

Threatened

*Timber Wolf	*Canis lupus*
*Bald Eagle	*Haliaeetus leucocephalus*

Endangered

*Whooping Crane	*Grus americana*
*American Peregrine Falcon	*Falco peregrinus anatum*
*Higgin's Eye Pearly Mussel	*Lampsilis higginsi*

MISSOURI

MAMMALS

Endangered

*Indiana Bat	*Myotis sodalis*
*Gray Bat	*Myotis grisescens*
River Otter	*Lutra canadensis*
*Eastern Cougar	*Felis concolor*
White-tailed Jackrabbit	*Lepus townsendii*

Rare

Keen's Bat	*Myotis keenii*
Western Big-Eared Bat	*Plecotus townsendii*
Eastern Big-Eared Bat	*Plecotus rafinesquii*
Black Bear	*Euarctos americanus*
Least Weasel	*Mustela nivalis*
Long-Tailed Weasel	*Mustela frenata*
Black-Tailed Jackrabbit	*Lepus californicus*
Swamp Rabbit	*Sylvilagus aquaticus*

Extirpated

*Red Wolf	*Canis niger*

Status Undetermined

Small-Footed Bat	*Myotis leibii*

MISSOURI (Cont'd)

BIRDS

Endangered

Red-Shouldered Hawk	*Buteo lineatus*
Barn Owl	*Tyto alba*
Double-Crested Cormorant	*Phalacrocorax auritus*
Marsh Hawk	*Circus cyaneus*
Sharp-Shinned Hawk	*Accipiter striatus*
Cooper's Hawk	*Accipiter cooperii*
Least Tern	*Sterna albifrons*
Swainson's Warbler	*Limnothlypis swainsonii*
Osprey	*Pandion haliaetus*
*Peregrine Falcon	*Falco peregrinus*

Rare

Ruffed Grouse	*Bonasa umbellus*
Greater Prairie Chicken	*Tympanuchus cupido*
Mississippi Kite	*Ictinia mississippiensis*
King Rail	*Rallus elegans*
Upland Sandpiper	*Bartramia longicauda*
Henslow's Sparrow	*Ammodramus henslowii*
Bachman's Sparrow	*Aimophila aestivalis*
*Bald Eagle	*Haliaeetus leucocephalus*

Status Undetermined

Black Rail	*Laterallus jamaicensis*

REPTILES

Endangered

Blanding's Turtle	*Emydoidea blandingi*
Queen Snake	*Regina septemvittata*
Illinois Mud Turtle	*Kinosternon flavescens spooneri*

Rare

Alligator Snapping Turtle	*Macroclemys temmincki*
Yellow Mud Turtle	*Kinosternon flavescens flavescens*
Great Plains Skink	*Eumeces obsoletus*
Great Water Snake	*Nerodia cyclopion cyclopion*
Plains Hognose Snake	*Heterodon nasicus nasicus*
Dusty Hognose Snake	*Heterodon nasicus gloydi*

MISSOURI (Cont'd)

REPTILES (Cont'd)

Rare

Eastern Massasauga	*Sistrurus catenatus catenatus*
Western Massasauga	*Sistrurus catenatus tergeminus*
Smooth Green Snake	*Opheodrys vernalis*

Status Undetermined

Scarlet Snake	*Cemophora coccina*

AMPHIBIANS

Endangered

Wood Frog	*Rana sylvatica*

Rare

Four-Toed Salamander	*Hemidactylium scutatum*
Oklahoma Salamander	*Eurycea tynerensis*

FISHES

Endangered

Lake Surgeon	*Acipenser fulvescens*
Pallid Sturgeon	*Scaphiryhnchus albus*
Blacknose Shiner	*Notropis heterolepis*
Taillight Shiner	*Notropis maculatus*
Pugnose Minnow	*Notropis emiliae*
Neosho Madtom	*Notropis placidus*
Spring Cavefish	*Chologaster agassizi*
Harlequin Darter	*Etheostoma histrio*
Goldstripe Darter	*Etheostoma parvipinne*

Rare

Southern Brook Lamprey	*Ichthyomyzon gagei*
American Brook Lamprey	*Lampetra lamottei*
Alligator Gar	*Lepisosteus spatula*
Alabama Shad	*Alosa alabamae*
Sturgeon Chub	*Hybopsis gelida*
Sicklefin Chub	*Hybopsis meeki*

MISSOURI (Cont'd)

FISHES (Cont'd)

Rare

Sabine Shiner	*Notropis sabinae*
Eastern Slim Minnow	*Pimephales tennellus parviceps*
Lake Chubsucker	*Erimyzon sucetta*
Brown Bullhead	*Ictalurus nebulosus*
Mountain Madtom	*Noturus eleutherus*
Ozark Cavefish	*Amblyopsis rosae*
Burbot	*Lota lota*
Plains Killifish	*Fundulus kansae*
Pumpkinseed	*Lepomis gibbosus*
Bantam Sunfish	*Lepomis symmetricus*
Niangua Darter	*Etheostoma nianguae*
Redfin Darter	*Etheostoma whipplei*
Bluestripe Darter	*Percina cymatotaenia*
Longnose Darter	*Percina nasuta*

Extirpated

Cypress Minnow	*Hybognathus hayi*
Pallid Shiner	*Notropis amnis*
Golden Topminnow	*Fundulus chrysotus*

NEBRASKA

MAMMALS

Endangered

*Black-Footed Ferret	*Mustela nigripes*
*Swift Fox	*Vulpes velox*

Threatened

Southern Flying Squirrel	*Glaucomys volans*

BIRDS

Endangered

*American Peregrine Falcon	*Falco peregrinus anatum*
*Arctic Peregrine Falcon	*Falco peregrinus tundrius*

NEBRASKA (Cont'd)

BIRDS (Cont'd)

Endangered

*Bald Eagle	*Haliaeetus leucocephalus*
*Whooping Crane	*Grus americana*
*Eskimo Curlew	*Numenius borealis*

Threatened

Interior Least Tern	*Sterna albifrons athalassos*
Mountain Plover	*Charadrius montanus*

FISHES

Threatened

Lake Sturgeon	*Acipenser fulvescens*
Pallid Sturgeon	*Scaphirhynchus albus*
Northern Redbelly Dace	*Phoxinus eos*
Pearl Dace	*Semotilus margarita*
Finescale Dace	*Phoxinus neogaeus*
Brook Stickleback	*Culaea inconstans*

OHIO

MAMMALS

Endangered

River Otter	*Lutra c. canadensis*
Bobcat	*Felis r. rufus*
*Indiana Bat	*Myotis sodalis*
Allegheny Woodrat	*Neotoma floridana magister*

BIRDS

Endangered

*American Peregrine Falcon	*Falco peregrinus anatum*
Sharp-Shinned Hawk	*Accipiter striatus velox*
*Bald Eagle	*Haliaeetus leucocephalus*
King Rail	*Rallus e. elegans*
*Kirtland's Warbler	*Dendroica kirtlandii*
Upland Sandpiper	*Bartramia longicauda*
Common Tern	*Sterna h. hirundo*

OHIO (Cont'd)

REPTILES

Endangered

Spotted Turtle	*Clemmys guttata*
Northern Copperbelly	*Natrix erythrogaster neglecta*
Eastern Plains Garter Snake	*Thamnophis r. radix*

AMPHIBIANS

Endangered

Blue-Spotted Salamander	*Ambystoma laterale*
Green Salamander	*Aneides aeneus*
Cave Salamander	*Eurycea lucifuga*
Four-Toed Salamander	*Hemidactylium scutatum*
Wehrle's Salamander	*Plethodon wehrlei*

FISH

Endangered

Ohio Lamprey	*Ichthyomyzon bdellium*
Northern Brook Lamprey	*Ichthyomyzon fossor*
Allegheny Brook Lamprey	*Ichthyomyzon greeleyi*
Silver Lamprey	*Ichthyomyzon unicuspis*
American Brook Lamprey	*Lampetra lamottei*
Lake Sturgeon	*Acipenser fulvescens*
Paddlefish	*Polyodon spathula*
Spotted Gar	*Lepisosteus oculatus*
Shortnose Gar	*Lepisosteus platostomus*
Mooneye	*Hiodon tergisus*
Cisco	*Coregonus artedii*
Great Lakes Muskellunge	*Esox m. masquinongy*
Rosyside Dace	*Clinostomus funduloides*
Tonguetied Minnow	*Exoglossum laurae*
Bigmouth Shiner	*Notropis dorsalis*
Pugnose Minnow	*Notropis emiliae*
Bigeye Shiner	*Notropis boops*
Ghost Shiner	*Notropis buchanani*
Blacknose Shiner	*Notropis heterolepis*
Silver Chub	*Hybopsis storeriana*
Longnose Sucker	*Catostomus catostomus*
Greater Redhorse	*Moxostoma valenciennesi*
Blue Sucker	*Cyclepfus elongatus*
River Redhorse	*Moxostoma carinatum*
Lake Chubsucker	*Erimyzon sucetta*
*Scioto Madtom	*Noturus trautmani*

OHIO (Cont'd)

FISH (Cont'd)

Endangered

Northern Madtom	*Noturus stigmosus*
Mountain Madtom	*Noturus eleutherus*
Pirate Perch	*Aphredoderus sayanus*
Burbot	*Lota lota*
Banded Killifish	*Fundulus diaphanus*
Iowa Darter	*Etheostoma exile*
Longhead Darter	*Percina macrocephala*
River Darter	*Percina shumardi*
Eastern Sand Darter	*Ammocrypta pellucida*
Channel Darter	*Percina copelandi*
*Blue Pike	*Stizostedion vitreum glaucum*
Tippecanoe Darter	*Etheostoma tippecanoe*
Slenderhead Darter	*Percina phoxocephala*
Spotted Darter	*Etheostoma maculatum*

CRUSTACEANS

Endangered

Allegheny Crayfish	*Orconectes obscurus*

MOLLUSKS

Endangered

Cob Shell	*Quadrula cylindrica*
Club Shell	*Pleurobema clava*
Fan Shell	*Cyprogenia stegaria*
*Orb Mucket	*Lampsilis orbiculata*
*White Cat's Paw Pearly Mussel	*Epioblasma sulcata perobliqua*
Northern Riffle Shell	*Epioblasma torulosa rangiana*
Simpson's Shell	*Simpsonaias ambigua*
Ridged Pocketbook	*Lampsilis ovata*
Yellow Sand Shell	*Lampsilis teres*
Fragile Heel-Splitter	*Potamilus laevissimus*
Nodule Shell	*Quadrula nodulata*
Monkeyface	*Quadrula metanevra*
Bullhead	*Plethobasus cyphyus*
Butterfly	*Plagiola lineolata*
Long-Solid	*Fusconaia maculata* (=*subrotunda*)
Ohio Pig Toe	*Pleurobema cordatum*

WISCONSIN (Cont'd)

MAMMALS

Endangered

Pine Marten	*Martes americana*
Canada Lynx	*Lynx canadensis*
*Gray Wolf	*Canis lupus*

Threatened

None

BIRDS

Endangered

Double-Crested Cormorant	*Phalacrocorax auritus*
*Bald Eagle	*Haliaeetus leucocephalus*
Osprey	*Pandion haliaetus*
*Peregrine Falcon	*Falco peregrinus*
Piping Plover	*Charadrius melodus*
Forster's Tern	*Sterna forsteri*
Common Tern	*Sterna hirundo*
Barn Owl	*Tyto alba*

Threatened

Great Egret	*Casmerodius albus*
Greater Prairie Chicken	*Tympanuchus cupido pinnatus*
Cooper's Hawk	*Accipiter cooperii*
Red-Shouldered Hawk	*Buteo lineatus*
Loggerhead Shrike	*Lanius ludovicianus*

REPTILES

Endangered

Wood Turtle	*Clemmys insculpta*
Ornate Box Turtle	*Terrapene ornata*
Queen Snake	*Regina septemvittata*
Western Ribbon Snake	*Thamnophis proximus*
Northern Ribbon Snake	*Thamnophis sauritus*
Massasauga	*Sistrurus catenatus*

WISCONSIN (Cont'd)

REPTILES (Cont'd)

Threatened

Glass Lizard	*Ophisaurus attenuatus*
Blanding's Turtle	*Emydoidea blandingi*

Endangered

None

Threatened

Spotted Salamander	*Ambystoma maculatum*
Tremblay's Salamander	*Ambystoma tremblayi*
Burns' Leopard Frog	*Rana pipiens burnsii*
Pickerel Frog	*Rana palustris*

FISHES

Endangered

Gravel Chub	*Hybopsis x-punctata*
Striped Shiner	*Notropis chrysocephalus*
Slender Madtom	*Noturus exilis*
Starhead Topminnow	*Fundulus notti*
Crystal Darter	*Ammocrypta asprella*
Gilt Darter	*Percina evides*
Bluntnose Darter	*Etheostoma chlorosomum*

Threatened

Goldeye	*Hiodon alosoides*
Speckled Chub	*Hybopsis aestivalis*
Pallid Shiner	*Notropis amnis*
Blue Sucker	*Cycleptus elongatus*
Black Buffalo	*Ictiobus niger*
River Redhorse	*Moxostoma carinatum*
Longear Sunfish	*Lepomis megalotis*
Mud Darter	*Etheostoma asprigene*
Pugnose Shiner	*Notropis anogenus*
Ozark Minnow	*Dionda nubila*

WISCONSIN (Cont'd)

MOLLUSCS

Endangered

*Higgin's Eye Pearly Mussel	*Lampsilis higginsi*

Threatened

None