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ANNOTATED PROPOSED
LIST
OF
ENDANGERED AND THREATENED
SPECIES
PLUS
RARE OR SCARCE
SPECIES



This is a proposed annotated list of endangered and threatened species resident in Michigan that is proceeding toward final approval in accordance with the Administrative Procedures Act. The annotations briefly set forth pertinent facts about each species and why it is endangered or threatened, as far as is known.

This list also includes, in most cases, rare or scarce species, and in some instances, peripheral species. These have no standing under the Endangered Species Act of 1974, Public Act No. 203, and do not appear on the Administrative Rules list, but rare or scarce and peripheral provide categories in which to place controversial or borderline cases so that they will not be lost sight of and will be studied and monitored in order that significant population trends are promptly noted and appropriate action taken.

Also included are membership lists of the technical advisory committees and the citizens advisory committee. These people have devoted many hours over the past year to the development of the proposed lists, without remuneration of any kind. Their expert assistance, of the very highest caliber, has made it possible to accomplish the task.

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DEFINITIONS

Endangered - "A species of fish or wildlife, or plant life which is in danger of extinction throughout all or a significant part of its range. . ."

The state list of "endangered" species will be those species listed by the Secretary of Interior as endangered and resident in any part of their life cycle in Michigan. It will also include those indigenous species which the State of Michigan feels should be included on the national list of endangered species because they are on the verge of extinction. The definition refers to worldwide status of a species. Also, it recognizes subspecies of fish or wildlife, or plant life, or lower taxa in a common spatial arrangement, that reproduce and represent a truly unique, identifiable form.

Threatened - "A species which is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range. . ."

The state list of "threatened" species includes those species, and lower taxa as defined under endangered, that are threatened with extirpation in Michigan. For the purposes of state law, the Michigan range is considered significant except when the state portion of the range is considered to be peripheral. Peripheral species will not be listed as "threatened" unless their populations are also threatened in their primary range outside of Michigan. Species whose range is now reduced to a relatively few isolated populations that do not interbreed are included within this definition, as are species which were once extirpated, but are now in the process of becoming re-established through introductions.

Rare or Scarce

A species or lower taxa that while not "endangered" or "threatened", is extremely uncommon in Michigan and deserves further study and monitoring. Peripheral species, not listed as "threatened" may be included in this category along with those species which were once "threatened" or "endangered" but now have increasing or protected, stable populations.

RECOMMENDED LIST OF ENDANGERED, THREATENED,
AND RARE MOLLUSKS IN MICHIGAN

Mussels

ENDANGERED

1. Simpsoniconcha ambigua (Say).

The shells of this species used to be found in large windrows around the western end of Lake Erie. The living animals are presumed to live under flat stones and in places where mud puppies occur. This is the only mussel known to use mud puppies as hosts for its' glochidia.

2. Obovaria leibii (Lea) = O. subrotunda (Rafinesque).

Restricted to Lake Erie and mouths of rivers flowing into it.

THREATENED

1. Pleurobema clava (Lamarck).

Not uncommon formerly in the St. Joseph of the Maumee. Intensive farming with modern development may well eliminate it in the Michigan portion of its range.

2. Elliptio complanatus (Dillwyn).

Widely distributed in the Upper Peninsula but only found in the Ocqueoc drainage of the Lower Peninsula. Extensive damage to the Ocqueoc would eliminate this important zoogeographic species.

3. Cyclonaias tuberculata (Rafinesque).

A large river species; hence, it will take the punishment the fauna in lower portions of rivers in the southern part of Michigan suffer from pollution, dredging, etc.

4. Anodonta subgibbosa (Anthony).

Confined to muddy sloughs in the western part of the state. The sites are so few that a typical habitat would be worth salvaging.

5. Actinonaias ellipsiformis (Lea).

Limited in distribution to streams flowing west into Lake Michigan; it invaded the Saginaw drainage in the post-glacial connection between the Saginaw and Grand rivers. It has a creek ecology and needs pristine conditions.

6. Lampsilis fasciola (Rafinesque).

A small river species, found only in drainages of southeastern Michigan flowing to Lake Erie. The development of the Detroit-Toledo megalopolis may well spell its doom.

7. Dysnomia triquetra (Rafinesque).

A highly sexually dimorphic species found in small river conditions in streams flowing to Lake Erie. Its future will be similar to that of Lampsilis fasciola.

RARE1. Carunculina glans (Barnes).

Mainly in Lake Erie or the mouths of rivers entering that lake. A small mussel, often with pink nacre.

2. Villosa (Micromya) fabilis (Lea).

A small and very thick-shelled species living in creeks of drainages to Lake Erie.

3. Dysnomia sulcata (Lea) = Dysnomia perplexa rangiana (Lea).

A highly sexually dimorphic species recorded mostly in the Detroit River drainage and drainages into Lake Erie, as well as Lake Erie itself.

SnailsENDANGERED

None

THREATENED1. Lymnaea megasoma (Say)

The only endemic North American lymnaeid which is found in sloughs of streams from Houghton Lake north. The ecology is sufficiently characteristic to warrant finding a site to be preserved.

2. Pomatiopsis cincinnatiensis (Lea).

Found today largely on the banks of the Raisin River where it has a unique ecology living on the mud between the waterline and the bank top. Its importance in relation to human schistosomiasis warrants trying to establish a preserve for its preservation in its natural setting.

3. Paludestrina (Fontigens) nicklineana (Lea).
A snail common in western Michigan living on watercress in cold water. Persons culturing watercress are apt to get rid of these snails. A molluscicide would spell its doom, should the few outlets of lakes that harbor it be threatened.
4. Amnicola binneyana (Hannibal) = Cincinnatia emarginata (Say).
Inhabits mud bottom at a 15-foot depth or greater in the margins of the Great Lakes. Serves as food for some lake fish. It may be threatened with pollution now entering the lakes.
5. Zoogenetes harpa (Say).
Found on litter on limestone outcrops around shoreline from Alpena to Traverse City.
6. Mesodon (Polygyra) sayana (Pilsbry).
Known only from a few counties in the central part of the southern peninsula.
7. Mesodon (Polygyra) elevata (Say).
In deep woods, in the lower corners of the state, evidently entering from the states to the south of Michigan. A rich deep woods harboring it should be set aside to preserve it (along with other species of this kind).
8. Triodopsis notata (Deshayes) = Polygyra palliata (Say).
Lives in rich hardwoods in the Saginaw-Grand Valley region.
9. Anguispira kochi (Pfeiffer) = A. solitaria (Say).
Known from southeastern Michigan where it lives in forest litter.
10. Mesomphix cupreus (Rafinesque) = Omphalina.
In woods below the Saginaw-Grand Valley region where it inhabits old and undisturbed forests. Forest removal will spell its doom.
11. Haplotrema concavum (Say) = Circinnaria.
A carnivore that feeds on other snails. It occupies the southern portion of the Lower Peninsula. Seems to have become quite rare in southeastern Michigan.
12. Discus patulus (Deshayes) = Gonyodiscus perspectivus (Say).
Confined to rich, deep forests; often found along edge of decaying logs. Extensive lumbering and farming have greatly reduced it in its range in southern Michigan.

RARE1. Lymnaea haldemani (Deshayes).

Found often on reeds in lakes. Its distribution is spotty and known in Michigan from only a few lakes, like Reeds Lake near Grand Rapids from which it vanished years ago.

2. Lymnaea contracta (Currier).

Known only from a couple of lakes in Michigan, at depths far beyond the ordinary where the clarity of the water permits vegetation to grow to unusual depths; Higgins Lake is one of the few sites known to support this species.

3. Helisoma multivolvis (Case).

Known only from Howe Lake in northern Michigan. Several attempts have been made to find it in recent years, but it has not been found since the original discovery in 1906.

4. Pyrgulopsis letsoni (Walker).

Seldom, if ever, found alive but often found in pleistocene deposits. E. G. Berry found live material in the Huron River above Ann Arbor. The changes in the river in recent years probably preclude ever finding it there again.

5. Planogyra astericus (Morse).

Lives in litter at edge of cedar swamps. Recorded from Isle Royale and the Porcupine Mountains, Ontonagon County.

6. Philomycus carolinianus (Bosc).

A large slug with a mottled mantle, living often under loose bark of decaying hardwood trees.

RECOMMENDED LIST OF ENDANGERED, THREATENED
AND RARE INSECTS IN MICHIGAN

ENDANGERED

1. Columbia Silkmoth, Hyalophora columbia (Smith).
Habitat is tamarack bogs.
2. Mitchell's Satyr, Euptychia mitchellii (French).
Habitat is sedge swamp.
3. Checkered White, Pieris protodice (Boisduval and LeConte).
A competitor of the cabbage butterfly.

THREATENED

None

RARE

1. Appalachia arcana (Hubbell and Cantrall).
Known only from bogs in eight counties in northern part of the southern peninsula. Filling bogs and lowland, as at Wurtsmith Air Force Base (the type locality of arcana now under ten inches of concrete), can result in extirpation of the species.
2. Atlanticus davisii (Rehn and Hebard).
An Appalachian form with disjunct, relict populations in seven counties in the northern part of the southern peninsula of Michigan.
3. Oecanthus pini (Beutenmuller).
An Appalachian form relict and disjunct in Berrien County.
4. Oecanthus laricis (T. J. Walker).
Known only from two counties in southern Michigan and one in northern Ohio. A bog form living on Tamarack.
5. Liodessus cantralli (Young).
This water beetle is known only from a small bog lake in Livingston County, Michigan.

RECOMMENDED LIST OF ENDANGERED, THREATENED
AND RARE FISHES IN MICHIGAN

ENDANGERED

1. Longjaw cisco, Coregonus alpenae (Koelz).

This species is officially listed as endangered by the Secretary of the Interior. It was last reported in Lake Erie in 1961, and is believed to be extinct in Lakes Huron and Michigan.

2. Deepwater cisco, Coregonus johannae (Wagner).

This species is regarded (by the Great Lakes Fishery Laboratory, U.S. Department of Interior) as extinct in both Lake Huron and Lake Michigan, the only known places where it occurred. Nevertheless, we recommend this listing to get the species on record for a year or so. It is very difficult to be certain of extinction of species unless the distribution is so localized that there can be no question of survival.

3. Blackfin cisco, Coregonus nigripinnis (Gill).

Regarded to be extinct in Lakes Ontario, Huron, Michigan and Superior. Recent studies on Lake Superior fish indicate that, although the species was recorded from this lake by Koelz, in actuality the species he had from Lake Superior was C. zenithicus (Parsons et al., 1975, mimeo account of status of some endemic Great Lakes fishes). The reason for listing this species is the same as given under the account of C. johannae.

4. Shortnose cisco, Coregonus reighardi (Koelz).

Regarded as extinct in Lake Ontario, endangered in Lakes Huron and Michigan, and greatly reduced in Lake Superior (according to the Great Lakes Fisheries Laboratory).

5. Shortjaw cisco, Coregonus zenithicus (Jordan and Evermann).

Regarded as greatly reduced in Lake Superior, and as erroneously recorded by Koelz from Lakes Huron and Michigan (his specimens are properly identified as C. reighardi--Parsons et al., 1975--see above).

6. Blue pike, Stizostedion vitreum glaucum (Hubbs).

Although we have no valid basis for regarding this fish as surviving at the present time in Lake Erie, the only known locality of occurrence, we recommend "endangered" status for a year or so, just to keep the species "on record" until its status is finalized. The fish is officially recognized as endangered by the Secretary of the Interior.

THREATENED1. Lake sturgeon, Acipenser fulvescens (Rafinesque).

Sturgeons as a group are late-maturing, and very long-lived fishes that do not tolerate a high level of exploitation. They are diminishing notably in numbers in many parts of the world. In Michigan, because of purposeful over-exploitation during the late 1800's, this species was greatly reduced in all lakes by the early 1900's. In fact, this fish became so scarce by the 1920's that sturgeon fishing was prohibited throughout most U.S. waters of Lakes Superior, Michigan and Huron. The species now occurs in Michigan in less than five percent of its former abundance. We recommend "threatened" status because there are places where a regulated sport fishery is compatible with maintenance of the species. The fishery should be carefully monitored to make sure that sufficient breeding stock persists each year. Maturity is not attained by most females of this species until an age approaching 25 years is reached; males mature between 14 and 20 years.

2. Cisco or lake herring, Coregonus artedii (Lesueur).

It is regarded by the Great Lakes Fishery Laboratory as rare or threatened in Lake Erie, threatened in Lakes Huron and Michigan, and declining (i.e., showing a recent general decline in abundance that obviously is not part of natural fluctuations) in Lake Superior. Placing it in the "threatened" category means that it becomes a legal candidate for financial aid in trying to halt its decline.

3. Bloater, Coregonus hoyi (Gill).

This species is declining in Lake Huron, threatened in Lake Michigan, and declining in Lake Superior. It is assigned to "threatened" status for the reason given above, for C. artedii.

4. Kiyi, Coregonus kiyi (Koelz).

Regarded as extinct in Lakes Ontario and Huron, endangered in Lake Michigan, and declining in Lake Superior (Great Lakes Fishery Laboratory). These are the only lakes from which the species is known.

5. Silver shiner, Notropis photogenis (Cope).

This species, peripheral in Michigan, is now very rare here, occurring naturally only in the southeastern part of the state. In recent years, it has been taken only in the Huron River (1940, 1954) and Raisin River (1973). This species, and several to follow, are part of the natural wildlife heritage of Michigan. The Committee feels that, irrespective of the status of peripheral Michigan species outside of the state, it is important that we retain as much of our native biota as possible. Placing this species in the threatened category calls attention to its rarity in Michigan, and to its need for help if it is to remain a part of our biota.

6. Redside dace, Clinostomus elongatus (Kirtland).

This species has a very discontinuous range in the U.S. and occurs in Michigan only in a few tributaries of Lake Erie. Our only recent record (1970) is from near Farmington, in the outlet to Devil's Lake. Reasons for listing this peripheral species are the same as given above for the silver shiner.

7. River redbhorse, Moxostoma carinatum (Cope).

The first (and last) valid known record of this mollusk-eating fish for Michigan is of a single adult taken on 25 July 1935 at Croton Dam, Newaygo County, in the Muskegon River drainage. An effort should be made to determine if the species still persists in that basin.

8. Northern madtom, Noturus stigmosus (Taylor).

This small catfish is known in Michigan only in the Huron River, except for one record (1938) from the junction of Lake St. Clair and the Detroit River. It has not been observed in the Huron River since 1954. Reasons for retaining it in our fauna are the same as given for the silver shiner (item 5.).

9. Eastern sand darter, Ammocrypta pellucida (Agassiz).

Species of this genus generally require clear, clean water with sand bottom; this type of habitat is under threat nearly everywhere. This fish--rare and peripheral in Michigan--is known from the St. Joseph River of the Maumee River basin (1929); Little Raisin River in Dover Township, Lenawee County (1927); Rouge River at Rouge Park, Wayne County (1936); Strawberry Lake, Livingston County (1949--and likely still present); Bouvier Bay of Lake St. Clair (1942); Big Gallagher Lake, Livingston County (1955); and Saline River near its mouth (1929). Reasons for retaining this peripheral species in Michigan's biota on our list are the same as given for the silver shiner (item 5.).

RARE

None

RECOMMENDED LIST OF ENDANGERED, THREATENED
AND RARE AMPHIBIANS IN MICHIGAN

ENDANGERED

None

THREATENED

1. Marbled Salamander, Ambystoma opacum (Gravenhorst).

This chunky and attractive salamander is very restricted in distribution. It is unusual in that it usually lays eggs during the fall in or near places likely to be flooded by winter moisture. The adults live in forested and low flood plain areas. Landfill and land clearance are the most obvious threat to their existence in the state; it is known from only one Michigan locality--in Berrien County.

2. Small-mouthed Salamander, Ambystoma texanum (Matthes).

This salamander is highly fossorial, spending much of its time in burrows and under logs. It is most abundant in somewhat open hardwood areas. It requires temporary pools for breeding in late winter and, therefore, is vulnerable to land clearing and draining practices; known only from three southeastern counties in Michigan, where it is common in a few localities.

3. Western Lesser Siren, Siren intermedia nettingi Goin

Siren are peculiar snake-like salamanders with external gills and short front limbs; hind limbs are absent. They are entirely aquatic and extremely restricted in their distribution in Michigan. Therefore, even slight changes in habitat in the few areas in which the species occurs could result in its extirpation in Michigan. It is, however, a very common species in many places in southeastern U.S. In Michigan, it is known from one locality each in Allegan and Van Buren counties.

RARE

1. Four-toed Salamander, Hemidactylum scutatum.

This small, poorly known salamander is generally found associated with decaying logs in wet woods; it requires ponds and bogs for breeding. Clearing of forests and woodlots, and draining and filling of low areas, are threats to its existence. In Michigan, we have records from 22 counties, scattered throughout the state.

RECOMMENDED LIST OF ENDANGERED, THREATENED
AND RARE REPTILES IN MICHIGAN

ENDANGERED

None

THREATENED

1. Black Rat Snake, Elaphe obsoleta obsoleta (Say).

This is the largest species of snake native to Michigan; it may reach a length of more than seven feet. Although common farther south in adjoining states, it is relatively uncommon in Michigan. This snake inhabits forests and woodlots; therefore, deforestation is the principal threat to its existence in Michigan. It feeds on small mammals, birds and bird eggs. It has potential economic importance by feeding on small rodents that feed on grain; however, it is not sufficiently common for this economic asset to be of significance. In Michigan, it is known from about 13 localities in eleven south-central and southeastern counties.

2. Northern Copperbelly, Natrix erythrogaster neglecta Conant

One of the largest of watersnakes in the U.S., this species, seemingly does well even in areas that are opened for development. However, since large water-dwelling snakes are considered poisonous by most people, slaughter of the snakes by man probably constitutes the greatest threat to its existence. In Michigan, it is known from a single locality in each of four southwestern counties.

3. Kirtland's Water Snake, Natrix (Clonophis) kirtlandi (Kennicott).

This small, attractive watersnake is poorly known throughout its range. It lives mostly in open, grassy areas and is less aquatic than most watersnakes. The young are born alive, as in other related species. Although it may be abundant in scattered localities, it is a rare species and probably threatened throughout its range. The species may have been rare and probably threatened prior to widespread habitat destruction by man. It has been reported in greatest abundance in urban localities in adjoining states, but its future there is obviously threatened by real estate developments. In Michigan, it is known from only seven localities in three southern counties.

4. Eastern Box Turtle, Terrapene carolina carolina (Linnaeus).

This attractive land turtle is fairly widely distributed in Michigan, but is spotty in its occurrence and nowhere very abundant. Most often found in or near open hardwood stands with sandy soil. The species is

commonly caught for pets, and such collecting represents a distinct threat to this species. Because of its long life cycle, recovery from population losses is extremely low. The species eats both vegetable matter and small invertebrate animals. In Michigan, it is known from 17 counties in western lower peninsula north to Benzie County.

RARE

1. Five-lined Skink, Eumeces fasciatus.

This small, shiny lizard is striped and possesses a bright blue tail when young. It is found most often on, or beneath, rotten logs or loose bark in wooded areas. Its eggs, which it guards, are laid in decaying wood. It was once common in beach debris along Lake Huron, but clearing of the beach areas during housing development has destroyed much of its habitat. Land clearing and removal of downed timber and debris from woodlands pose a major threat to the survival of this species. In Michigan, it is known from 50 or more localities scattered over the state; including the central part of the Upper Peninsula.

2. Eastern Spiny Softshell, Trionyx spiniferus spiniferus.

This strictly aquatic turtle, with a flexible shell, is widespread in lower Michigan. It lives in streams, lakes, rivers and ponds, but prefers sandy aquatic habitats and needs sand bars for reproductive purposes. Its food in Michigan consists largely of crayfish and insects. In some areas within its range, the species is quite abundant in sewage treatment ponds; propagation of this species could be attempted in such ponds in Michigan. Its flesh is considered a delicacy as human food. In Michigan, we have records from 20 counties, mostly in southern lower peninsula.

3. Spotted Turtle, Clemmys guttata.

This turtle may be found on land or in water, but seems to occur most often in bog areas, especially along small streams through meadows. It has seldom been found in abundance in Michigan, even though it occurs over much of the lower peninsula. Because it is both rare and attractive, it is likely to be collected as a pet. Drainage and over-grazing are threats to this species. In Michigan, it is known from about 25 localities in 21 counties, almost all in the southern half of the lower peninsula.

4. Wood Turtle, Clemmys insculpta.

This, like the box turtle, is among the most terrestrial of all U.S. turtles. It is common in woodlands, often associated with streams or other aquatic habitats. It feeds on a variety of plants, insects, earthworms, and molluscs. This species is widespread in Michigan, especially in the north; but nowhere is it common. Because it is not nearly so attractive as the spotted turtle, it is unlikely to be collected as a pet as often as the latter. In Michigan, it is presently known from 23 counties, from the middle of the lower peninsula through the upper peninsula.

RECOMMENDED LIST OF
ENDANGERED, THREATENED, AND RARE OR SCARCE
MICHIGAN BIRDS

(The last category has no legal status under
the Michigan Endangered Species Act.)

ENDANGERED SPECIES (Designated as Endangered on federal lists)

1. Peregrine Falcon -- Falco peregrinus Tunstall

The peregrine falcon at one time was more commonly called the Duck Hawk, in reference to its ability and inclination to take ducks as food. It is best that that name be dropped altogether to avoid prejudicing anyone against this magnificent bird. Falcons were so highly regarded in ancient times that they actually were worshipped in Egypt. That they could be trained for hunting was discovered about 2000 B.C. in Asia. By the twelfth century A.D. falconry was widely practiced throughout Europe. Falcons are still highly valued for such use by modern-day falconers, but the peregrine can no longer be so used in the United States because of its endangered status and protection under the federal Endangered Species Act of 1973.

This beautiful raptor is gone from Michigan as a breeding bird; the last nests as far as is known were reported in the late 1950's. In 1912 Barrows (Michigan Bird Life) said the species was nowhere common in Michigan. Since it prefers a cliff situation for nesting, the peregrine certainly has always had considerably less nesting habitat to pick and choose from than the other hawks. Favored cliffs are those with ledges up high with little chance of disturbance by man or other mammals. One author ventures that "there is a threshold of acceptability of a cliff by peregrines that is subject to themselves." Dr. Tom Cade who directs falcon breeding research at the Cornell University Laboratory of Ornithology feels that tradition may play a part in linking generations of peregrines to the same cliff. If the sequence of use is broken a site may be reoccupied at once by other falcons or it may never be used again. Cade also speaks of mated peregrines which "have successfully established all the social adjustments required for a strong pair bond." All of these and still other factors would seem to pose problems for any effort to reestablish breeding pairs to a former range. Such attempts have been made and are to be continued by the Cornell laboratory within the continental United States east of the Mississippi River where the peregrine has been missing as a nester for some years.

The primary cause of the peregrine falcon's extirpation from so large a part of its former range is considered to be environmental pollution with pesticides, particularly DDT. As with other raptors such as the bald eagle, thinning of the eggshells which usually results in hatching failure has been very detrimental to successful reproduction.

Food of the peregrine consists almost entirely of bird life -- waterfowl, shorebirds, and a great variety of other birds from grouse to the smaller passerines.

It would seem that controls on the use of DDT and certain other pesticides might possibly allow the peregrine to reestablish itself in suitable habitat. Optimistically, this could happen in Michigan. In behalf of this bird our most productive first efforts might well be to cooperate in any project for introducing pen-reared peregrines into suitable Michigan habitat, give absolute protection to any nest site whether from natural or artificial reestablishment, and strictly enforce the law which gives full protection for the bird itself.

2. Kirtland's Warbler -- Dendroica kirtlandii (Baird)

The Kirtland's Warbler is Michigan's own bird when considering breeding populations. It is known to nest only in several counties in north-central lower Michigan -- nowhere else in the world. Strangely enough its nesting grounds were not discovered until 52 years after the first specimen was collected in 1851. This occurred on May 13 near Rockport, Ohio when the bird was on migration. The species was named kirtlandii after a Dr. J. P. Kirtland in honor of his promotion of the knowledge of natural history. The first bird found in winter was recorded on January 8, 1879, on Andros Island in the Bahamas. In the years following, it was well established that these islands were the wintering grounds of this warbler. Between September and April the bird has never been seen anywhere else.

Discovery of the nesting grounds was by an experienced ornithologist from the University of Michigan Museum of Zoology who, while on a fishing trip in Oscoda County, heard several of the birds singing in the jack pine forest country. A specimen he collected was identified as the Kirtland's Warbler by Dr. Norman Wood of the University museum.

After it was discovered that this warbler nested in Michigan's northern Lower Peninsula, further studies were made to determine the extent of the breeding range. W. B. Barrows who published his comprehensive "Michigan Bird Life" in 1912 wrote of his attempt to locate the warbler in other counties with habitat similar to that in the known nesting areas, but without success. He surmised that eventually studies might show this bird to nest in Wisconsin, Minnesota, on up to Hudson Bay, and even westward into Manitoba. Such was not to be the case, however, and Michigan retained the right to claim the Kirtland's as its own warbler. The maximum breeding range was found to occupy an area of only about 85 miles by 100 miles in size.

It is not known what the maximum breeding population of this warbler may have been after the nesting grounds were discovered. But, because of its limited range, numbers must always have been very limited in comparison to those of most songbirds. It remained until 1951 for a reliable count to be made. In a cooperative report headed by Harold Mayfield a June census was conducted by counting all singing males that could be located. A total of 432 males were recorded on 91 different sections of land. All areas known to support or suspected of supporting warblers were checked. By that year many formerly occupied areas had no singing birds. Over the years since then, additional censuses have been made, first at 10-year intervals, but since 1970, annually. The areas and counts for these six censuses are:

<u>Year</u>	<u>Counties</u>	<u>No. Seen</u>	<u>Singing Males</u>	<u>Year</u>	<u>Counties</u>	<u>No. Seen</u>	<u>Singing Males</u>
1951	8	91	432	1972	4	25	200
1961	9	86	502	1973	4	25	216
1971	6	27	201	1974	5	26	167
				1975	6	31	179

These counts show clearly that the Kirtland's Warbler is indeed endangered -- in danger of complete extirpation. Fifteen years ago there undoubtedly were more than 1,000 of these birds on the breeding territory in the northern part of our State. Five years ago there were less than half that number; and by 1974 the number was down to about one-third as many.

Concerning breeding range, the problem seems to be simply that this bird demands a very precise sort of habitat. They are selective as to soil type; kind, size, and density of tree cover; and ground cover.

Typically the habitat most attractive to the nesting warblers is a stand of jack pine with special characteristics. A tract must be at least 80 acres in size, preferably larger. There must be a considerable amount of open area interspersed with homogeneous thickets of small pines which must be from 6 feet to 20 feet in height, or up to 20 years of age. Nesting sites are chosen by the birds where the pines are thick enough to present low interlocking branches, still alive and green, in edge situations next to openings. Stands of grasses and low shrubs such as blueberry, and sweet fern, all less than a foot high, underneath the pines, make up the ground cover. Grayling sand is so typical of the nesting range of this bird that it seems almost as if the warbler seeks out the jack pine only if it is growing on this particular type of soil.

Through studies by the Department, U.S. Forest Service, and ornithologists, it has been determined that in addition to the necessity of perpetuating the preferred habitat of the warbler, certain other steps must be taken if this bird is to be saved. Cowbird parasitism of warbler nests has been determined to be a severe problem. In recent years cowbirds have been trapped and removed from the breeding grounds by the thousands. Indications are that this has improved rearing success of the warblers.

As a further safeguard, it has been determined that the warblers must not be disturbed on the nesting grounds by intrusion of motor vehicles, maneuvering national guardsmen, or even by researchers or bird watchers. Seasonal closure to entry of the prime nesting areas has been placed in effect.

An official Kirtland's Warbler Recovery Team has been appointed by the Secretary of the U.S. Department of the Interior to develop a total plan for recovery and perpetuation of the species. Its stated goal is to achieve and maintain a breeding population of 1,000 birds on the traditional Michigan range. Currently maintenance of sufficient optimum breeding habitat and control of cowbirds are considered to be the two main requirements for accomplishing this goal.

THREATENED SPECIES

1. Double-crested Cormorant, Phalacrocorax auritus (Lesson)

The cormorant was not known to breed in Michigan in the early 1900's, though it was distributed generally over the state during migrations. Although never a common species, breeding populations were recorded later in Great Lakes shoreline habitats until about 1960. In the 15 years since then it is doubtful that any successful nesting has occurred. The last known nesting attempt in Michigan, unsuccessful, was in 1972 -- by seven pairs near Little St. Martin's Island. The species has a low reproductive rate and thinning of eggshells due to pesticide buildup, mainly DDT, is considered an important factor in reduced breeding success. The cormorant does not breed until two or more years of age. Colonies are extremely vulnerable to disturbance by man which leads to loss of eggs and young to gulls.

Its diet consists mainly of fish and herpetological species.

With DDT use now banned in Michigan, primary recovery efforts should be aimed mainly at protecting any habitat occupied by cormorants attempting to nest.

2. Cooper's Hawk, Accipiter cooperi (Bonaparte)

Formerly this hawk was one of Michigan's most abundant. It nested throughout the state, but most commonly in southern Michigan, occurring here at all seasons. Some authorities noted a drastic decrease over the years when DDT was commonly in use. Very few of these birds were found breeding in the late 1950's and throughout the 1960's. There is no conclusive evidence of recovery since then. In the last three years only seven nest sites have been known in Michigan.

The diet of this hawk is mainly bird life. Years ago it was one of the most efficient at taking chickens in areas where poultry was allowed barnyard freedom but this feeding propensity is no longer a concern under modern conditions of poultry housing.

3. Red-shouldered Hawk, Buteo lineatus (Gmelin).

In the early 1900's the red-shouldered was an abundant hawk, frequenting all parts of the state. As recently as 25 years ago it was perhaps the most common hawk in southern Michigan. It has undergone a severe decline since then, causes for which are poorly understood; probable reasons are loss of habitat and environmental pollutants. The bird takes a great variety of animal life for food; much of this consists of the small mammals, reptiles, insects and other species found in the lowland woods along rivers and creeks, the favorite nesting habitat of this hawk.

Now, most breeding areas are to be found in the northern Lower Peninsula. Any woodlands where nests are found should be left undisturbed to help recovery.

4. Bald Eagle, Haliaeetus leucocephalus (Linnaeus).

This bird, the largest raptor in Michigan, is distributed throughout the Upper Peninsula and much of the northern Lower Peninsula, especially in association with water. It is thought to have nested in every county of the state originally. The 1975 spring survey found 61 resident pairs in the Upper Peninsula, 27 resident pairs in the Lower Peninsula.

Production of eagles has at last appeared to "turn around" after a population decline beginning about 30 years ago. The presence of chlorinated hydrocarbons in the environment has been a demonstrated cause of reproductive failure in this and other predatory birds, especially those whose diet consists mainly of fish as does that of the eagle. With increasingly tight controls of pollutants such as DDT, contaminant loads of monitored wildlife has also declined. This is believed to be at least part of the cause of increased nesting success. Some dangerous pollutants such as PCB remain largely uncontrolled, so a threat still exists. Loss of nest sites through encroaching developments and losses to gunfire remain as other major population threats.

The DNR continues to monitor nesting success in cooperation with the Fish and Wildlife Service and the Forest Service biologists. Protection is given nesting sites in the state forest management plans. Inclusion on the threatened species list will focus public attention on this species which needs continued attention.

5. Marsh Hawk, Circus cyaneus (Linnaeus).

This species also was one of the commonest of Michigan's summer resident hawks. Its feeding habits lead to its being readily observed as it sweeps low across marshlands, grassy swales and fields. Small mammals, insects and some ground nesting birds form much of its diet.

The marsh hawk too has suffered a serious population decline, noticeably so during the period when DDT was in heavy use. Greatest reduction in numbers has been in southern Michigan; it fares better in the Upper Peninsula. Drainage and other destruction of marshland areas which has reduced the amount of this bird's favorite habitat undoubtedly has contributed to the decline.

6. Osprey, Pandion haliaetus (Linnaeus).

As with the bald eagle, distribution of the osprey is confined to the northern portions of the state. Osprey range is somewhat more restricted coinciding directly with water systems. Original distribution was nearly cosmopolitan, as extensive as that of any bird of prey.

Sharp declines in osprey populations were noted throughout the eastern United States in the late 1950's and early 1960's, coincident with large-scale uses of organochloride pesticides (DDT, heptachlor, dieldrin, endrin, chlordane).

Improved production noted in the 1975 spring nesting survey gives some cause for optimism. With the Michigan population composed of 46 resident pairs in the Upper Peninsula and 35 resident pairs in the Lower Peninsula, 97 young were produced in 1975, the best production noted in the past 11 years surveyed. However, production still barely reaches the level required to maintain a stable population. Pesticide controls have improved the level of ecosystem contamination, but PCB's remain largely uncontrolled. Wilful shooting continues as a drain on this small population.

The DNR annually surveys nest sites and production in cooperation with the U.S. Fish and Wildlife Service and U.S. Forest Service. Guidelines protecting nest sites and restricting human activities in nest vicinities are incorporated in forest management plans.

This bird would benefit from inclusion on the DNR list of threatened species. The population remains at a precariously low level and public attention to its plight could marshal support for protection and enhancement.

7. Greater Prairie Chicken, Tympanuchus cupido (Linnaeus).

Once plentiful in many parts of Michigan, including the Upper Peninsula, prairie chickens maintain a precarious hold in a few isolated colonies in the northern Lower Peninsula. The 1975 spring census of known booming grounds indicated a population of only approximately 50 birds, fewer than in 1974, frequenting a few locations in Osceola, Missaukee and Crawford counties. Habitat changes due to altered land use patterns and successional changes from grass, to brush, to forests, and intensified agriculture have caused their disappearance from other areas.

A DNR management plan for the principal colony at Marion has been completed. Habitat manipulations, including prescribed burns, planting of small grains and corn, mowing, and brush cutting are routinely applied to prairie chicken lands. State land ownership is being increased and restrictive measures implemented to give the birds additional protection against disturbance. The area surrounding the booming ground is posted against entry during the mating and nesting season. Since 1975 they have been completely protected against killing in the Lower Peninsula under the Natural Resources Commission order. The birds were believed to have disappeared from the Upper Peninsula by 1960.

Public response to the plight of the prairie chicken has been admirable. Approximately \$31,000 has been donated in its behalf for land acquisition and management of the birds.

Designation as a threatened species on a state list would not greatly alter our activities in behalf of this bird; we presently do all that is possible within practical limits for land use constraints and financial resources. However, the publicity resulting from an official "threatened" designation might result in increased public awareness of the bird's plight and further public support for our recovery program.

8. Piping Plover, Charadrius melodus Ord

At the turn of the century this water bird which feeds on aquatic life including insects, crustaceans and mollusks, was reported to be found everywhere along the shores of the Great Lakes. It was considered to be a breeder wherever conditions were suitable, meaning undisturbed, flat pebbly beaches above the water line and below the dunes. In 1951, one authority (Wood) noted that it was a summer resident north to the top of the Lower Peninsula and into Delta and Schoolcraft counties. In 1974, another authority (Pettingill) recorded it as breeding in Michigan only at Waugoshance Point, Emmet County and at Rogers City where they had nested successfully for the past four years. No successful nests were found in the Waugoshance Point area.

Increasing human recreational use of the lakeshore beaches, disruptive to nesting, is considered the primary threat which could doom this bird in Michigan. Excessively high water levels of the Great Lakes which eliminate much suitable beach areas normally available for nesting has also been a problem.

Protection of nesting areas perhaps by state acquisition or through arrangements with private owners if possible would seem to offer effective means to insure a breeding population.

9. Barn Owl, Tyto alba (Scopoli).

The barn owl which is nearly worldwide in distribution was formerly a resident throughout southern Michigan with a few records for the northern Lower Peninsula. It is unusual among the owls in that it has always been inclined to live and nest close to humans, and in the past frequently nested, in cities and villages, in a church tower, old mill or abandoned building. Mice are a prominent part of its diet.

Although never as plentiful here as in many other parts of its range, numbers are now much reduced. In the mid-1940's there were at least 10 known nest sites in six southern counties; some with as many as seven young per nest, not an unusual number for this species. Now it is apparently confined to Monroe County with four known nests in 1975 and possibly Berrien County (one questionable nesting record for 1975). Old silos have become important to the barn owl as nesting sites. At least one on a game area was preserved for a nesting pair.

It would seem feasible to supply suitable nesting sites if lack of such is an important factor causing the population decline, as some believe. Nest boxes have been supplied with some success by at least one Audubon Society member. An active program to furnish such help for the bird could mean survival as a resident of Michigan.

10. Loggerhead Shrike, Lanius ludovicianus Linnaeus

The shrike was considered by early observers as beneficial because its diet consisted mainly of insects with some mice and a few birds taken occasionally. Although once widely distributed over most of rural Michigan it occurred only sparingly. In the late 1800's and early 1900's it was considerably more common than now. Already prior to 1940 it became apparent that numbers were decreasing and by that date they had become very uncommon residents. Competent observers noted only a few nesting successfully over the years since then, from the Detroit area to Emmet and Cheboygan counties in the north. Between 1940 and 1960 these records seemed to indicate brief local increases. Now they are considered to occur as nesters quite rarely.

No good reasons for the decline of the shrike in Michigan have been ventured.

RARE OR SCARCE

1. Common Loon, Gavia immer (Brunnich).

This bird has become rare through a slow, steady decline in breeding range, a decline probably due to buildup of pesticides in fish which constitute almost their entire diet, and disturbance of breeding grounds caused by recreational boating. It has a low productive rate, one brood or two young per season.

2. Black-crowned Night Heron, Nycticorax nycticorax (Linnaeus).

Early Michigan records of the species up to 1904 and 1912 indicate that it was rare or uncommon, however, this may have been in part due to smaller numbers of field workers in those years, since the first nesting observed in the state (1916) was substantial (350 pairs) and thereafter for 40 years large colonies of hundreds of nesting pairs were under observation in southeastern Michigan and Saginaw Bay areas. In 1957, previously large colonies were suddenly and completely abandoned and in the following 15 to 18 years, the number of birds was extremely low with apparently little or no nesting. Then in 1971 there were indications of the beginnings of possible recovery (44 nests in one colony on Gull Island, Alpena County); in 1974 about 90 birds were reported in mid-June in Erie marshes, Monroe County. In 1975 a DNR biologist noted as many as 50 birds in the air at one time in mid-summer, mostly immatures at the Nayanquing Point Wildlife Area, and other observers found several nesting pairs and an influx of about 100 immatures near the location of a former large colony at Bay City. Causes of the decline are not specifically known, but high water levels or pesticides or both are suggested. This species feeds mainly on fish and other aquatic life.

3. American Bittern, Botaurus lentiginosus (Rackett).

Reported as a common summer resident of Michigan as late as 1957. Species is easily identified by both its physical appearance and distinctive call, which make it one of the more commonly reported heron species. There has been an increase in field reporting of birds in general during the last 10-15 years without a corresponding increase in reports of the bittern.

Even though the species has been mentioned as one needing special attention regarding the reporting of sight records, the number of observations has continued to decline. Only four breeding records have been recorded in the last four years. Causes of the apparent decline of this species are not known at present, but habitat destruction by the draining of suitable marsh habitat, other environmental factors, and pesticides may be involved. It feeds on fish and aquatic animal life.

4. Sharp-shinned Hawk, Accipiter striatus Vieillot

Breeding distribution of this secretive species is poorly known. Transient over most of the state, nesting usually only in the Upper Peninsula. Its diet is almost entirely birds. Is sensitive to environmental pollutants.

5. Pigeon Hawk, Falco columbarius Linnaeus

It is a rare breeder in the north. Never common in Michigan, its former breeding distribution is poorly known; present status is unknown. Is sensitive to environmental pollutants. Feeds on small birds.

6. Sandhill Crane, Grus canadensis Linnaeus

This species feeds on fish, herpetological species, mammals, insects and vegetable matter. Most of these cranes nest in marsh areas that are constantly threatened by developments, drainage, muck farming, oil drilling, and road building. Protected areas include Baker Sanctuary, Haehnle Sanctuary, Rose Lake Wildlife Research Center, and some surrounding farm areas where the owners are "sympathetic" to the cranes, and the Seney Wildlife Refuge in the Upper Peninsula. It is felt that the cranes in Michigan owe their survival to the concerted efforts of conservationists in protecting them. Their survival as breeding residents seems not to be in jeopardy at this time.

7. Caspian Tern, Hydroprogne caspia (Pallas).

Although largely a cosmopolitan species, the breeding population in Michigan is confined to isolated islands in Lake Michigan and Lake Huron (breeding recorded in up to five counties). Exact numbers of breeding pairs are not known for the period prior to 1923. In 1924, Shoe Island alone had between 1,000-1,500 breeding pairs, in 1962 only 100 breeding pairs; an additional 500± breeding pairs were observed on

two other islands that year. Because caspian terns are fish eaters, the population should be expected to suffer similarly as have other populations decimated by DDT and other pesticides.

8. Barred Owl, Strix varia Barton

This was Michigan's most common owl, most abundant in the south, in the early 1900's. Similar to the red-shouldered hawk in this respect, it is a resident of woodlands, especially those near water, seldom leaving such habitat. It preys mainly on mice, other small mammals, and aquatic life such as frogs and crayfish. The probable cause of reduced numbers is loss of habitat, as farm woodlots and other mature forested areas have been eliminated.

RECOMMENDED LISTS OF
ENDANGERED, THREATENED, RARE OR SCARCE, AND PERIPHERAL
MICHIGAN MAMMALS

(The last two categories have no legal status
under the Michigan Endangered Species Act.)

ENDANGERED SPECIES (Designated as Endangered on federal lists)

1. Indiana bat, Myotis sodalis Miller and Allen

The Indiana bat, a small insectivorous species weighing about 10 grams, frequents natural cavities in the "cave country" of eastern United States. Its normal distribution extends from Missouri in the southwest to New England in the northeast. Since Michigan lacks suitable natural caves, this bat probably has never frequented Michigan with great regularity except that it appears here in the summer months. As far as specimens are concerned, other than one recorded for Grosse Isle in 1928, there have been a few recoveries in summertime of individuals banded in Kentucky. Since bats fly and the cave country in southern Indiana and Ohio is not far away, it is highly probable that this bat may visit southern Michigan more than generally realized. Nevertheless, in Michigan no special protective measures can be designed for this species whose numbers across its entire worldwide range have decreased to the point where its continued survival is considered in jeopardy.

2. Eastern timber wolf, Canis lupus lycaon Schreber

The gray wolf formerly was one of the most widespread in occurrence of all terrestrial mammals. In Eurasia it was found as far south as India and in North America as far south as Mexico City. The subspecies, eastern timber wolf, has been designated officially as endangered by federal authorities because it no longer occurs over large expanses of its original range in the United States. This is the subspecies found in Michigan and which occurs also in Minnesota and Ontario. The wolves which are still found plentifully in Alaska are not of this subspecies.

Michigan became a state in 1837, in 1938 the Legislature instituted a wolf bounty. Federal and state trappers were substituted for the bounty from 1921 until 1935. By the time the restored bounty was dropped in 1960 it was too late to help the wolf. As late as 1956, 30 were bountied, then seven in 1957, and only one in 1959. The bounty was without doubt an important decimating factor.

After the wolf population was no longer able to sustain itself as a reproducing population, full legal protection was finally provided by legislative action in 1965. However, the coyote is still bountied in Michigan and coyote trapping and shooting, for bounty collection, remain a real threat to any wolf.

There is still "wolf country" on Michigan's mainland (the Isle Royale wolves are well known) but in the last 13 years no more than two wolves have been observed together and probably no more than six or so exist here.

The only effective method for re-establishment now would seem to be introduction of enough individuals to serve as a nucleus for a pack. This was tried unsuccessfully on a modest scale in 1974 when, in a project that gained national attention, four wolves, two adult males and an adult and a juvenile female, were captured in the wild in Minnesota and released in the remote Huron Mountain country. Two were shot, one taken by a coyote trapper, the other killed by a car.

There would seem to be three prerequisites for further attempts to restore the wolf:

1. Removal of bounty on coyotes.
2. Political support to obtain funding as well as bounty removal.
3. Public acceptance of the wolf as a valuable member of our wildlife heritage to gain better protection from human interference.

THREATENED

1. Least shrew, Cryptotis parva (Say).

This southeastern species reaches the northern limits of its range in southern Michigan. Records in prior years indicate that this shrew has been found as far north as the fourth tier of southern counties. It is supposed that the least shrew is a newcomer to the fauna of the state, possibly not moving northward until land clearing by early day settlers provided suitable open habitat. As late as the 1940's, the little shrew was observed with fair regularity in southern Michigan. However, the paucity of records in recent years may indicate that the animal has experienced a decline. Perhaps this has been the result of land use practices or successional changes. At any rate, in 1976 this little shrew must be considered rare in Michigan, and records are solicited from field observers of any of the southern counties.

2. Pine marten, Martes americana (Turton).

The marten, one of Michigan's finest fur bearers, occurred originally in some abundance, primarily in the more northern parts of the Lower Peninsula and the Upper Peninsula, in its preferred habitat, dense coniferous forests. It is an animal that is largely nocturnal and most at home in the trees. Included in its varied diet are squirrels, rabbits, small mammals, birds and their eggs, amphibians, reptiles, fish, insects, and even nuts and fruits.

There is little data available on early numbers or population density, but by the mid-twenties they were considered gone from the state, retreating before the ax and the trap.

A first attempt at re-establishment was made in 1956-57 when the Department released 29 in the Porcupine Mountains area of Ontonagon County. These were wild trapped in Ontario except for one pair purchased from a fur farm in British Columbia. By 1965 this introduction was termed a failure.

A second introduction was arranged by cooperative agreement with the U.S. Forest Service, which helped finance the project. A total of 99,

62 males and 37 females were purchased under contract from trappers who live-trapped them north of Thunder Bay, Ontario, where there was a population irruption. The martens were flown in by plane, ear-tagged and were all liberated about 10 miles north of the town of Rapid River in Delta County in the winters of 1968-69 and 1969-70. To protect them, 12 townships in Delta and Alger counties were closed to dry-land trapping for five years. In the first year following release, four martens were recovered, one of which was an untagged immature male, indicating some productivity. Several sightings of young martens were recorded also. Between early July, 1972, and late April, 1974, eight more observations were made at locations ranging from two to as many as 90 miles from the release sites.

The marten remains fully protected under Michigan law. Removal of the bounty on coyotes would help prevent losses due to incidental catches. The few martens which may still cling to survival should be protected under provisions of the Endangered Species Act.

3. Southern bog lemming, Synaptomys cooperi Baird

Michigan is in almost the exact center of the range of this small, short-tailed rodent in eastern North America. Although it has been observed in many parts of the state in times past, in recent years few records of this runway-making vole have been taken. Some mammalogists have considered that a reason for decline of the species is competition for habitat with the more abundant meadow vole (Microtus pennsylvanicus). It is possible that the bog lemming may have been much more abundant in pre-settlement days but has not thrived as a result of forest clearing, marsh drainage, and introduction of non-native grasses. All of these factors also may have favored the expansion of the range of the meadow vole. The bog lemming should be expected in moist, grassy situations in any part of the state. It is a species which needs to be very carefully monitored.

4. Pine vole, Microtus pinetorum (Le Conte).

The pine vole reaches the northwestern limits of its range in the Lower Peninsula of Michigan, being much more abundant in southeastern United States. It seems to prefer grassy situations at the margins of woodlands. The pine vole is generally less conspicuous than other Michigan voles since it seems to prefer living in underground burrows rather than using surface runways as do the meadow vole (Microtus pennsylvanicus) and the bog lemming (Synptomys cooperi). The pine vole is thought to be limited in numbers but widely distributed in southern Michigan. This is based on the paucity of recorded trap catches of this rodent in Michigan in recent years.

RARE OR SCARCE

1. Arctic shrew, Sorex arcticus Kerr

This large and handsome shrew occurs throughout the greater part of central and western Canada and Alaska, reaching the southeastern most limits of its range in Upper Peninsula Michigan. Even though habitat

for the species may be marginal in Michigan, this shrew has been collected in recent years in moist, grassy situations bordering boreal woodlands and swamps. We do not know whether arctic shrew populations are stable or declining. The species needs further study in our area. Certainly the preservation of moist, boreal areas are important in maintenance of this insectivore.

2. Water shrew, Sorex palustris Richardson

The water shrew occurs in the Upper Peninsula and the boreal sector of the upper part of the Lower Peninsula. Elsewhere it lives in the northern coniferous forest zones in southern Canada and northern United States. This shrew is the most aquatic of North American soricids. Its major distribution in upper Michigan is along water courses, especially small streams and swamp edges, where it forages for animal foods both along shorelines and in water. Traps set at the water's edge in such situations along streams of the Upper Peninsula have successfully captured this large, dark-backed shrew. As far as is known, this species is not threatened in Michigan; however, pollution of small streams by domestic or industrial wastes might affect its distribution profoundly.

3. Hoy's pigmy shrew, Microsorex hoyi (Baird) (Upper Peninsula).

4. Thompson's pigmy shrew, Microsorex thompsoni (Baird) (Lower Peninsula).

Shrews of the genus Microsorex are found throughout southern Canada and into Alaska in the north and south into parts of northern United States especially in the eastern part. We know little about the status of these tiny mammals in Michigan since very few have been discovered. Perhaps others have actually been found but not identified since the only sure way of distinguishing this genus from the masked shrew (Sorex cinereus) is by counting the number of teeth. In most parts of its range, the pigmy shrews have been observed in both open, grassy situations and in forested areas, either in dry or moist locations. Consequently, their habits seem to closely approximate those of the masked shrew. Whether competition with the more abundant masked shrew affects the populations of the pigmy shrews is unknown. We need more records of these diminutive mammals from the state in order to determine their status and distribution patterns.

5. Hoary bat, Lasiurus cinereus (Palisot de Beauvois).

The hoary bat, Michigan's largest and most attractive species, is a rarely seen summer resident. Part of its supposed scarcity results from its habit of hanging singly and inconspicuously among leaves in tall trees. On summer nights the hoary bat may be recognized by its large wingspread when darting for insects in the glare of street lights. We know little of its migratory habits and whether Michigan-reared individuals fly as far south in winter as the tropics. By placing it on the unofficial rare or scarce list we may encourage observers to record more about its status in Michigan.

6. Badger, Taxidea taxus (Schreber).

This fossorial carnivore probably did not become widespread in Michigan until clearing took place after settlement. Its range closely approximates that of the thirteen-lined ground squirrel (Citellus tridecemlineatus) in both the Upper and Lower Peninsulas. It is infrequently observed except as an occasional road kill. It is included on our list of rare or scarce species because while its status is uncertain it is now only rarely noted by field workers.

7. Canada lynx, Lynx canadensis Kerr

After being extirpated from Michigan in earlier days, the lynx made a nice comeback in Michigan's Upper Peninsula in the middle 1950's, presumably spreading southward naturally from Ontario. Since that time, specimens have been reported in several localities, mostly by outdoors persons and Department of Natural Resources biologists. Probably the lynx is now once again an established member of Michigan's mammalian fauna. Even so, its numbers should be watched carefully and its relationship to the more abundant bobcat needs to be studied.

PERIPHERAL1. Eastern pipistrelle, Pipistrellus subflavus.

The eastern pipistrelle is a common cavity-dwelling bat in much of eastern United States. However, it has only been reported on one occasion in Michigan, in an abandoned mine tunnel in the Upper Peninsula. Very likely there is a resident population of these diminutive bats since harborage is available in much of the mining district in the Upper Peninsula. It is expected that this pipistrelle may be scarce or absent in other parts of Michigan.

2. Evening bat, Nycticeius humeralis (Rafinesque).

This small bat is a resident of southeastern North American, reaching the northern limit of its range in southern Michigan. In summer it may be found in such daytime retreats as tree holds, buildings, or even on tree bark. Probably it would be best observed foraging along streams in late evening. There is only one record of this small bat from Michigan; however, it should be watched for in summer in any of the southern counties as far north as Midland.

3. Gray fox, Urocyon cinereoargenteus (Schreber).

The gray fox reaches the northern edge of its range in Michigan. This southern species may have actively extended its range into our state only after the land clearing which took place after settlement. It is much less conspicuous than our common red fox (Vulpes fulva). Whether or not these two species are in competition, perhaps for food and home sites, with the gray fox being the less successful is unclear. Observations of this species should be recorded to determine if the resident population is on the decline.

4. Prairie vole, Microtus ochrogaster (Wagner).

The prairie vole may be slowly extending its range in grassy areas in southwestern Michigan, especially in the counties bordering Lake Michigan. Like the least shrew (Cryptotis parva) this vole is probably a newcomer to Michigan having moved in when clearing provided suitable habitat. The species occurs mostly in the plains section of the United States. Little is known of the interaction between the meadow vole (Microtus pennsylvanicus) and the prairie vole in Michigan, although in parts of the Great Plains where these two species occur in the same area, the prairie vole prefers dry grassy habitats and the meadow vole prefers moist ones. Its presence in Michigan should be carefully watched.

5. Moose, Alces alces (Linnaeus).

The upper part of the Lower Peninsula and the Upper Peninsula are a part of the ancestral range of the moose. However, this species was extirpated by man in the early days of settlement. In recent years, moose have in the Upper Peninsula presumably through periodic crossings of the St. Mary's River from Ontario. Observations of these magnificent animals are made each year, with records being kept by Department of Natural Resources biologists. No substantial population has yet developed. The species needs thorough protection in order to become firmly re-established as a part of Michigan fauna.

MICHIGAN ENDANGERED PLANTS

PTERIDOPHYTES

1. *Lycopodium* sp. nov. J. G. Bruce
No common name. A proposed new species of bog club-moss.
Lycopodiaceae. Club-moss family.
Very local in borrow pits near Lake Michigan.
Michigan counties: Van Buren.
2. *L. sitchense*
Sitka club-moss.
Lycopodiaceae. Club-moss family.
Highly local in borrow pits in Upper Peninsula.
Michigan counties: Chippewa.
3. *Phyllitis scolopendrium* var. *americanum*
Hart's-tongue fern.
Polypodiaceae. Fern family.
Highly localized, disjunct areas; rock ledges and crevices,
cool slopes, or sinkholes of dolomite or other calcareous
rock.
Michigan counties: Chippewa, Mackinac.
(on U. S. endangered list)
4. *Woodsia abbeae*
No common name.
Polypodiaceae. Fern family.
A small tufted fern.
Highly localized, western UP, rock crevices and ledges.
Michigan counties: Marquette, Ontonagon.
(on U. S. endangered list)

MONOCOTS

5. *Scirpus hallii*
No common name.
Cyperaceae. Sedge family.
A small annual bulrush with ridged seeds.
Highly localized, shores of one small lake.
Michigan counties: Muskegon.
6. *Polygonatum biflorum* var. *melleum*
Solomon's-seal. A rare variety.
Liliaceae. Lily family.
Herbaceous perennial. Small honey-yellow flowers.
Woods and open thickets. One locality -- the type locality of the variety.
Michigan counties: St. Clair.
7. *Isotria medeoloides*
Smaller whorled pogonia.
Orchidaceae. Orchid family.
Greenish-yellow flowers, small and lily-like.
Upland woods. One locality.
Michigan counties: Berrien.
(on U. S. endangered list)

DICOTS

8. *Panax quinquefolius*
Ginseng.
Araliaceae. Ginseng family.
Small herbaceous perennial. Root sought for medicinal properties.
Rich and cool woods. Formerly in most counties of southern
Lower Peninsula. Now rare and highly exploited.
9. *Arnica cordifolia* (=A. whitneyi)
Heart-leaved arnica.
Asteraceae. Composite family.
Small herbaceous perennial. Yellow daisy-like flowers.
Dry woods. Few localities, includes the type locality of
A. whitneyi.
Michigan counties: Keweenaw.
10. *Opuntia fragilis*
Fragile prickly-pear.
Cactaceae. Cactus family.
Low moundlike clumps. Segments plump rather than flat.
Dry rocky openings. One locality in Huron Mountains.
Michigan counties: Marquette.
11. *Baptisia leucophaea*
Cream wild indigo.
Fabaceae. Legume family.
Herbaceous perennial; stem and leaves hairy, blackening in
drying; flowers large, cream, pea-like.
Prairies and thin oak woods.
Michigan counties: Kalamazoo.
12. *Petalostemon purpureum*
Red prairie clover.
Fabaceae. Legume family.
Herbaceous perennial. Flowers small, rose-purple, clover-like.
Dry uplands. A prairie species.
Michigan counties: Van Buren.
13. *Castanea dentata*
American chestnut.
Fagaceae. Beech family.
Upland forest tree.
Once common in southeastern Michigan. Now nearly eliminated
throughout its native range by chestnut blight. (Planted else-
where in Michigan)
14. *Gentiana saponaria*
Soapwort gentian.
Gentianaceae. Gentian family.
Herbaceous perennial. Blue tube-shaped flowers, more open than
the usual bottle gentian.
Moist sandy prairie or oak woods.
Michigan counties: Berrien.

15. *Nelumbo lutea* (*N. pentapetala*)
American lotus.
Nymphaeaceae. Water-lily family.
Aquatic perennial, emersed or floating umbrella-like leaves and large elevated, pale yellow flowers.
Shallow water and muddy shores. Lake Erie marshes.
Michigan counties: Monroe; (introduced elsewhere) formerly Wayne.
16. *Chamaerhodos nuttallii* var. *keweenawensis*
No common name.
Rosaceae. Rose family.
Small, low herbaceous perennial, with cleft leaves and tiny white flowers.
Gravelly bluffs. One locality.
Michigan counties: Keweenaw -- type locality of the variety.
17. *Chelone obliqua*
Purple turtlehead.
Scrophulariaceae. Figwort family.
Herbaceous perennial. Purple snapdragon-like flowers.
Wet woods and thickets. Probably now only one locality.
Michigan counties: Washtenaw.