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Population Trends Among Iowa's Amphibians and Reptiles¹

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Sampling conducted from 1970 to 1980 indicates that ranges of about 69% of the species and subspecies of amphibians and reptiles found in the state are receding. Of Iowa's 76 forms, 15% are considered in danger of extinction in the state, 22% threatened with ultimate extinction if corrective action is not taken, and 32% are declining. Only 8% have shown improvement in recent years and the remaining 22% appears relatively stable. Further studies are needed to precisely determine the status of each form and outline protective strategies.

INDEX DESCRIPTORS: Amphibians, Reptiles, Herpetology, Extinction, Population Trends, Iowa Fauna.

Interest in Iowa's amphibians and reptiles seemingly began in the middle and late 1800's when collections from the state were deposited in the U.S. National Museum by B.F. Odell (in 1855 from eastern Iowa), C. Aldrich (in 1878 from central Iowa), D.S. Sheldon (in 1880 from eastern Iowa), and R.E. Call (in 1887 from central Iowa). Since 1900, specimens collected in Iowa have been added to research collections throughout the country. The only published statewide work on Iowa's herpetofauna was a report by Guthrie (1926) on the snakes of Iowa, although this did not provide details of distribution. The greatest single contribution to knowledge of the state's amphibians and reptiles was provided by the extensive collections made by Dr. Reeve Bailey from 1939 through 1946. Most of these collections are deposited in the Iowa State University research collection and the University of Michigan Museum of Zoology. Bailey also published 7 papers dealing with the amphibians and reptiles of Iowa and has contributed to a comprehensive work on this subject now in preparation. The largest collection of amphibians and reptiles from Iowa is now the Drake University Research Collection with approximately 3,000 specimens.

Today Iowa is known to have 76 amphibian and reptile species and subspecies including 23 amphibians (18 frogs and toads, and 5 salamanders) and 53 reptiles (14 turtles, 6 lizards, and 33 snakes). There are 4 families of frogs represented in Iowa, 3 of salamanders, 4 of turtles, 3 of lizards, and 2 of snakes. Those amphibian and reptilian species considered threatened or endangered in Iowa are summarized by Roosa (1977) and Christiansen and Burken (1978).

Iowa's amphibians and reptiles, as verified by collections made since the year 1900, are listed in Table I. Suspected occurrences that have not been verified are not listed and forms believed to have been introduced but not to have established breeding populations are also excluded. Subspecies are identified whenever the species is polytypic.

INDICATED POPULATION TRENDS

Substantial changes in abundance of amphibians and reptiles are implied by checks of localities where specimens were taken in past years. Amphibians and reptiles taken in collections throughout Iowa and deposited in museums imply that many species have suffered drastic declines and only a few have increased. In instances not verified by sampling records, alteration and destruction of critical habitat have implied a decline in numbers. The suggested population trend of each Iowa species is given in Table I.

In making the judgments shown in Table I an attempt was made to be as conservative as possible. For example, the toads are shown as

unchanged even though possibly 60% of their habitat has been converted from forest and prairie to farmland. Their unchanged status is because breeding populations are surviving in roadside ditches and farm ponds and specimens can still be found in the disturbed areas even though they are undoubtedly much less abundant. It should also be noted that some of the rare and endangered forms have always been peripheral segments of populations more abundant elsewhere. Their listing as rare or endangered honestly reflects their status in Iowa but the implication that they are rapidly decreasing comes more from obvious loss of their required habitats than from the always sparse sampling records.

Anura (Frogs and Toads)

The frogs and toads have done better than any other of the comparably sized groups of amphibians or reptiles in Iowa (Table II). Approximately 56% of them appear to be stable or increasing and I would conjecture that this is primarily because of the large number of "r" selected anuran species with high reproductive potentials. While natural prairie and woodland pools have nearly disappeared, man-made roadside ditches and farm ponds have replaced them. Toad tadpoles spend much of their time in shallows where they avoid many fish, making even stocked ponds acceptable breeding areas. Some members of the leopard frog group can be found in nearly all the ponds in Iowa (J.T. Crawford, paper presented to 1979 meeting, Iowa Acad. Sci.). Bullfrogs were introduced in much of the state and, because of this and their fierce competitive ability, they now appear to be abundant almost everywhere. The spadefoot toad, although peripheral to the large population in the western United States, is abundant in the loess hills of western Iowa (Christiansen and Crawford, paper presented to 1979 meeting, Iowa Acad. Sci.). The tree frogs, including the small chorus frogs and larger gray tree frogs, are suffering from draining of shallow prairie marshes, their primary habitat (Christiansen and Bailey, unpubl.). Temporary woodland pools provide the breeding grounds for the once abundant spring peeper (Noble, 1931) and their loss has undoubtedly contributed to that species' decline. The toads, apparently maintaining their ranges in the state, were summarized by Bailey and Bailey (1940).

Caudata (Salamanders)

With one exception, salamanders have not adjusted well to the changes resulting from agriculture in Iowa. The exception is the tiger salamander, apparently more adaptable to disturbed habitats (Smith, 1961) and able to survive in roadside ditches and unstocked farm ponds with tremendous reproductive success. It is known to be an excellent burrower and thereby escapes summer desiccation. Iowa's other salamanders are more closely tied to woodland habitat. Smallmouth salamanders are secretive and were not known in Iowa until discovered by Bailey (1940). The loss of woodland marshes has severely reduced smallmouth salamander and newt habitats (Christiansen and Burken, 1978; Crawford, paper presented to 1980 meeting, Iowa Acad. Sci.).

¹Based on a contribution to the symposium "Perspectives on Iowa's declining flora and fauna" held at the 92nd session of the Iowa Academy of Science, 18 April, 1980.

<i>Thamnophis proximus proximus</i> (Say)	Western Ribbon Snake	D
<i>Tropidoclonion lineatum lineatum</i> (Hallowell)	Northern Lined Snake	T
<i>Storeria dekayi wrightorum</i> Trapido	Midland Brown Snake	D
<i>Storeria dekayi texana</i> Trapido	Texas Brown Snake	D
<i>Storeria occipitomaculata occipitomaculata</i> (Storer)	Northern Redbelly Snake	T
<i>Virginia valeriae elegans</i> (Kennicott)	Western Earth Snake	T
<i>Carpophis amoenus vermis</i> (Kennicott)	Western Worm Snake	T
<i>Diadophis punctatus arnyi</i> (Kennicott)	Prairie Ringneck Snake	D
<i>Heterodon platyrhinos</i> Latreille	Eastern Hognose Snake	D
<i>Heterodon nasicus nasicus</i> Baird and Girard	Plains Hognose Snake	D
<i>Coluber constrictor foxi</i> (Baird and Girard)	Blue Racer	D
<i>Coluber constrictor flaviventris</i> (Say)	Eastern Yellowbelly Racer	D
<i>Opheodrys vernalis blanchardi</i> Grobman	Western Smooth Green Snake	T
<i>Pituophis melanoleucus sayi</i> (Schlegel)	Bullsnake	D
<i>Elaphe vulpina vulpina</i> (Baird and Girard)	Western Fox Snake	U
<i>Elaphe obsoleta obsoleta</i> (Say)	Black Rat Snake	T
<i>Lampropeltis getulus holbrooki</i> (Stejneger)	Speckled Kingsnake	E
<i>Lampropeltis calligaster calligaster</i> (Harlan)	Prairie Kingsnake	T
<i>Lampropeltis triangulum sypila</i> (Cope)	Red Milk Snake	D
<i>Lampropeltis triangulum triangulum</i> (Lacépède)	Eastern Milk Snake	D
Crotalidae	Pit Vipers	
<i>Crotalus horridus</i> Linnaeus	Timber Rattlesnake	D
<i>Crotalus viridis viridis</i> (Rafinesque)	Prairie Rattlesnake	E
<i>Sistrurus catenatus catenatus</i> (Rafinesque)	Eastern Massasauga	E
<i>Sistrurus catenatus tergeminus</i> (Say)	Western Massasauga	E
<i>Agkistrodon contortrix mokasen</i> (Daudin)	Northern Copperhead	E

The blue-spotted salamander was discovered in Iowa by Menzel and Goellner (1976) and is only known to occur in 2 small localities. It appears that introduction of large predatory fish is detrimental to many salamander species and has been especially costly to the mudpuppy. Bailey (pers. comm., field notes) found them in most of Iowa's large rivers before 1945. Recent records are extremely sparse.

Testudines (Turtles)

Two turtle species have clearly profited from the advent of agriculture in Iowa. Even though snapping and painted turtles occurred in natural prairie and woodland pools, present evidence indicates that they

are found more in pools deep enough to retain water all year. The advent of farm ponds provided many more of these than occurred naturally and the number of farm ponds in Iowa has increased to about one per square mile (Natural Resource Inventory, 1977). The predatory fish with which they are often stocked are apparently usually unable to catch turtle hatchlings in the shallow water along pond edges. Slow and dead fish as well as almost all other pond dwelling animals provide food that both species consume (Ernst and Barbour, 1973; Punzo, 1975). Both species are now found in large numbers in almost every square mile of Iowa (Christiansen and Bailey, unpublished field notes).

Map and false map turtles appear to be maintaining their populations in the large rivers of eastern Iowa and are considered unchanged although industrial and residential expansion into some nesting areas on the Mississippi River has probably reduced populations in some areas (Christiansen, unpublished data). Softshell turtle populations have suffered from river straightening but are still found in all rivers from which we have early records (Williams and Christiansen, 1981).

Turtles dependent on shallow prairie or woodland marshes are declining in response to outright destruction of these habitats or their conversion to deeper ponds. Blanding's turtles are found now almost exclusively in Iowa's few remaining marshes (Christiansen and Bailey, unpublished field notes). Illinois mud turtles and stinkpots require a sandy environment in Iowa and have declined with the loss of sandy woodland pools (Christiansen, paper presented to 1980 meeting, Iowa Acad. Sci.). Iowa populations of both forms are probably relicts of larger populations that once covered much of the eastern part of the state. Similarly, red-eared turtles have declined in abundance along the large rivers of south-eastern Iowa (Christiansen and Burken, 1978).

Turtles with more terrestrial habits have suffered considerably as a result of both habitat destruction and random collection by man. Wood turtles will probably be extinct in Iowa in a few more years and box turtles are now rare in all but a few places where they were once common (Christiansen and Bailey, unpublished records). The deep-river dwelling alligator snapper has been found on the Illinois side of the Mississippi River (Smith, 1961) and therefore probably occurs on the Iowa side, although no verified Iowa records exist. It has a southern big river distribution and an Iowa population would be on the extreme northern fringe of the range.

Lacertilia (Lizards)

Iowa's lizard populations have probably suffered more from agriculture than any other group of animals. All of the 6 forms found in the state are believed to be rare or declining (Roosa, 1977; Christiansen and Burken, 1978). Iowa's racerunners are found only in sandy habitats (Christiansen and Bailey, unpublished records), most of which have been converted to row crops. The skinks and glass lizards are woodland or woodland edge animals and have declined with the loss of this habitat. The five-lined skink and northern prairie skink remain only where the terrain is too rough to farm. The Great Plains skink is on the edge of its range in Iowa and may never have been common (Bailey, 1943). The slender glass lizard is very secretive and is found occasionally in south-eastern Iowa (Christiansen and Bailey, unpublished records).

Serpentes (Snakes)

The snakes comprise the largest reptilian group in the state, with 33 forms occurring here. None of these appears to be increasing in abundance and only 6 seem to be maintaining their earlier distributional patterns. The latter relatively stable forms include the northern water snake and those garter snakes that have adapted to pond-side existence and balance direct attack by man with high reproductive rates. These include the 2 eastern garter snake subspecies and the 2 plains garter snake subspecies found in Iowa. Fox snakes appear to have adapted better than bullsnakes to barnyard environments but both are still rela-

Table II. A summary of suggested trends in populations of Iowa's species and subspecies of amphibian and reptile.

	Endangered		Threatened		Declining		Unchanged		Increasing		Total # Forms
	#	(%)	#	(%)	#	(%)	#	(%)	#	(%)	
Anura (Frogs & Toads)	0	(0)	2	(11)	6	(33)	7	(39)	3	(17)	18
Caudata (Salamanders)	3	(60)	1	(20)	0	(0)	0	(0)	1	(20)	5
Testudines (Turtles)	1	(7)	5	(36)	2	(14)	4	(29)	2	(14)	14
Lacertilia (Lizards)	1	(17)	1	(17)	4	(67)	0	(0)	0	(0)	6
Serpentes (Snakes)	<u>7</u>	(21)	<u>8</u>	(24)	<u>12</u>	(36)	<u>6</u>	(18)	<u>0</u>	(0)	<u>33</u>
Total Number	12	(15%)	17	(22%)	24	(32%)	17	(22%)	6	(8%)	76

tively common.

The most severely endangered snakes include the diamondback and yellow-belly water snakes and the speckled kingsnake, all peripheral to larger populations farther south. All the venomous snakes of Iowa are endangered except the timber rattlesnake. The latter species has declined to about half its past recorded Iowa range. The massasauga is known now from only 4 localities, the prairie rattlesnake from only 2, and the copperhead from only 1. The decline in the venomous species is the result of a combination of habitat destruction and willful intensive eradication by man.

The near elimination of the speckled kingsnake and the threatened status of several other harmless forms has resulted almost exclusively from loss of woodland and woodland prairie ecotone. Especially sensitive to loss of woodland-meadow edge are the now threatened populations of worm snakes (Bailey, 1939), earth snakes (see Christiansen, 1973), prairie kingsnakes (Bailey, 1939), lined snakes, milk snakes, and rat snakes. Graham's water snake, a species that feeds on crayfish, has declined directly with the loss of shallow marsh habitats. Ringneck snakes, brown snakes, milk snakes, racers, and others are surviving well where habitat remains but have been reduced severely as a result of loss of natural woodland and prairie. Like many other species, stable populations remain only where the terrain is too rough to cultivate. Today this is only extremely rocky or heavily eroded areas.

DISCUSSION

A summary of the status of Iowa's amphibians and reptiles is provided by Table II. While it might be argued that some secretive species are not sampled adequately enough to determine trends, the inescapable conclusion is that the majority of forms have declined severely since the advent of European man and that many forms are approaching extinction in the state. It is difficult to make an economic case for the salvage of any species that has already declined to the point of negligible impact on the ecosystem. This is especially true when that salvage is in conflict with jobs, man's food supply, or economic expansion. However, when one considers that fully 69% (53 of 76) of Iowa's amphibian and reptile

species are believed to be endangered, threatened or declining, the number of animals involved and their environmental impact is substantial. Without a clear-cut reversal in present trends it is likely that in the next 50-100 years less than a third of Iowa's present amphibian and reptile fauna will remain.

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