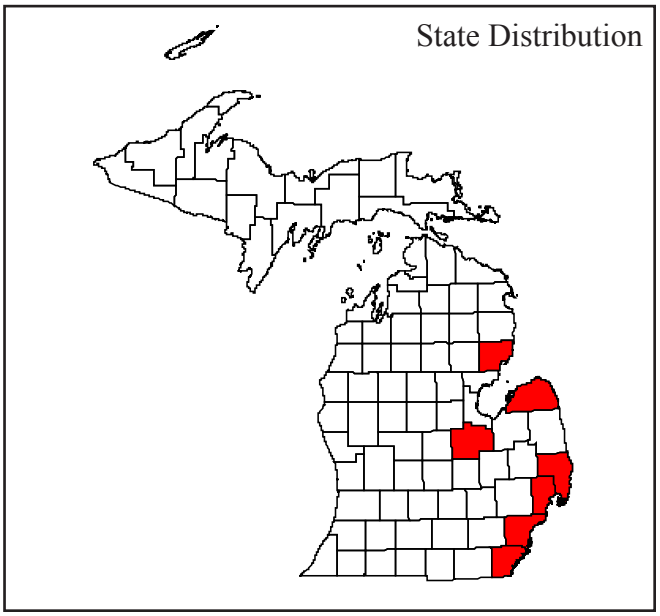
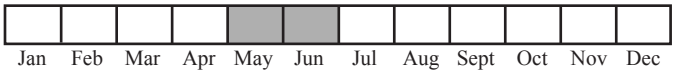
Pantherophis gloydi Conant — eastern fox snake



Best Survey Period



Status: State threatened

Global and state rank: G5T3/S2

Family: Colubridae

Range: The eastern fox snake resides entirely within the Great Lakes basin. This species is restricted to the shoreline and near shore areas along southern Lake Huron from Saginaw Bay, Michigan and Georgian Bay, Ontario south to the Detroit River and Lake St. Clair, and along western Lake Erie from Monroe and Wayne counties in Michigan to Norfolk County, Ontario and Erie County, Ohio (Harding 1997). Eastern fox snakes also have been documented from Pelee Island and some of the smaller islands in Lake Erie. The more common western subspecies (*Elaphe vulpina vulpina*) occurs in the western Great Lakes basin from the central Upper Peninsula in Michigan west and south through Wisconsin, southeastern Minnesota and Iowa to northwestern Indiana, northern Illinois and eastern portions of South Dakota, Nebraska and Missouri.

State distribution: Historically, eastern fox snakes have been known to occur in seven counties in southern Michigan. However, the species has not been reported from Huron County since 1936, and the report from Iosco County is outside the species' historical range and needs to be verified. These snakes have been documented along the shoreline of lakes Erie, St. Clair and Huron, as well as along the Raisin, Detroit, Clinton and Shiawassee rivers and their tributaries. A survey for the eastern fox snake in 1986 documented four main, isolated populations in southern Michigan, two in Monroe County along Lake Erie, one in St. Clair County along Lake St. Clair, and one in Saginaw County associated with the Shiawassee River and its tributaries (Weatherby 1986).

Recognition: The eastern fox snake is boldly patterned with a row of **large dark brown or black blotches down the middle of the back** and **smaller, alternating blotches on the sides** on a **yellowish to light brown background**. The head varies in color from yellow or light brown to reddish brown, usually with a **dark band between the eyes**, a **band extending downward from the eye to the mouth**, and a **band extending backwards from the eye to the corner of the mouth** (Harding 1997). The **underside** is **yellowish with irregular rows of dark squarish spots**. The scales are keeled (i.e., have a raised ridge), and the anal plate (i.e., enlarged scale that partly covers the anal or cloacal opening) is divided. Adults range in length from 3 to 5.5 feet (Harding 1997). Juvenile eastern fox snakes are paler in color than the adults, and have gray or brown blotches bordered in black on the back and more distinctive head markings.

Several snakes in Michigan are similar in appearance and may be confused with the eastern fox snake. Western fox snakes do not overlap in range, although they are similar in size and have a greater number of smaller blotches on the back (range 32 to 52, average 41, as opposed to 28 to 43, average 34 on the eastern fox snake) (Harding 1997). Juvenile black rat snakes (*Elaphe obsoleta obsoleta*, State special concern) are

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strongly patterned and have a very similar body pattern and coloration to the eastern fox snake (see Harding 1997); the only way to distinguish the juveniles of the two species is by counting the scales on the underside of the snake (Evers 1994) (216 or fewer in eastern fox snake and 221 or more in black rat snake) (Conant and Collins 1998). Young blue racers (*Coluber constrictor foxi*) also have dark blotches but they have smooth scales and no line from the eye to the corner of the mouth (Harding 1997; see Conant and Collins 1998). Several species have similar-looking adults. The adult northern water snake *(Nerodia sipedon*) has crossbands instead of blotches. The adult eastern hog-nosed snake (*Heterodon platyrhinos*) has an upturned snout and occurs in sandy environments. Eastern milk snakes (*Lampropeltis triangulum triangulum*) have smooth scales and undivided anal plates. Eastern massasaugas (*Sistrurus catenatus catenatus*, state special concern) have a rattle at all ages.

Best survey time: The best time to survey for this species is May and June when the snakes are most active and most visible. Eastern fox snakes are active during all hours of the day, with peak activity from 1100 to 1900 hours (Kraus and Schuett 1982). Currently, the best way to survey for this species is to conduct visual surveys for basking or dispersing individuals. They are often found basking on artificially created dikes, muskrat houses, road embankments or other elevated sites (Conant 1938, Weatherby 1986). They also are often found along the edge of marshes. Following exceptionally hot days, eastern fox snakes can be found at night on roads (Weatherby 1986).

Habitat: The eastern fox snake inhabits emergent wetlands along Great Lakes shorelines and associated large rivers and impoundments (Evers 1994). They prefer habitats with herbaceous vegetation such as cattails (*Typha* spp). Although primarily an open wetland species, eastern fox snakes also occupy drier habitats such as vegetated dunes and beaches, and occasionally wander along ditches and into nearby farm fields, pastures, and woodlots (Harding 1997). Eastern fox snakes on Lake Erie islands occupy rocky areas and open woodlands.

Biology: Fox snakes are the least known of the North American snakes in its genus (Ernst and Barbour 1989). Little is known about the life history of the eastern fox snake; much of it is presumed to be similar to that of the better known western fox snake and other snakes in its genus (Evers 1994). Eastern fox snakes typically are active from mid-April to late October with peak activity in May and June (Evers 1994, Harding 1997). Eastern fox snakes are active throughout the day, but during intense heat, may become more nocturnal (Evers 1994). Eastern fox snakes are seldom found far from water, and are capable of swimming long distances over open offshore waters and between islands (Harding 1997). Limited home range studies have indicated individual movements of up to several hundred feet (Rivard 1976, Freedman and Catling 1979). This species hibernates in abandoned mammal burrows, muskrat lodges or other suitable shelters (Ernst and Barbour 1989, Harding 1997). These snakes may congregate and share overwintering sites.

Eastern fox snakes probably breed annually, beginning at two (Evers 1994) or three to four years of age (Harding 1997). Mating occurs in June and early July (Ernst and Barbour 1989). Eggs are usually laid in late June or July, and possibly into August. Eggs are deposited in the soil, hollow logs, rotting stumps, sawdust piles and mammal burrows, as well as under logs, boards and mats of decaying vegetation. Clutch size averages 15 to 20 eggs per clutch (Ernst and Barbour 1989). Hatching occurs from mid-August to early October (Harding 1997).

Eastern fox snakes feed primarily on small mammals, particularly meadow voles (*Microtus*) and deer mice (*Peromyscus*) (Harding 1997). They also will eat bird eggs and nestlings, earthworms, insects and frogs. Natural predators include egrets, herons, hawks, raccoons, foxes and mink. Juvenile fox snakes have additional predators such as large fish and frogs, turtles, shrews, weasels, and even rodents (Harding 1997). Young-of-the-year fox snakes experience high mortality, and generally remain under cover. When disturbed, young fox snakes may strike and bite, but older snakes rarely bite, even when handled; instead they shake or “rattle” their tail vigorously and may spray a musky-smelling anal secretion (which is supposedly foxlike and hence its name).

Conservation/management: The eastern fox snake has drastically declined in many areas where it was once abundant but can be locally common in areas where extensive habitat is still available (Harding 1997). The primary threats to this species are continued habitat loss and degradation of Great Lakes coastal marshes, human persecution and illegal collection for the pet trade (Evers 1994, Harding 1997). Much of this species’ habitat has been ditched and drained for agriculture, residential and industrial development. The remaining suitable wetlands and waterways are currently threatened by the same factors as well as pollution and other forms of degradation. Although the four known populations in Michigan occupy sites that are partially owned and protected by state or federal government, public access and use of these sites are still relatively unrestricted. In addition to habitat loss, this species is often mistaken for venomous species such as the eastern massasauga and copperhead snake (which is not found in Michigan) and many fox snakes are killed as a result. Eastern fox snakes also are threatened by increased road traffic and road density associated with development.

Protection and management of remaining populations and habitat is crucial for conservation of this species in Michigan. Management of emergent wetlands should include limiting disturbance on dike areas (e.g., restricting mowing between mid-June and mid-October) and microhabitat enhancement such as providing adequate nesting sites as well as refugia for young snakes by maintaining, creating or transporting woody debris (e.g., hollow logs) at/to a site (Weatherby 1986). Prescribed burning of suitable habitat should be conducted before the snakes emerge from hibernation (i.e., typically before mid-April) or on days when the snakes are unlikely to be basking or above ground (e.g., on cloudy/overcast days with air temperatures below 55°F). In addition to habitat protection, public education is needed to help facilitate proper identification of this snake, to demonstrate the value and benefits of maintaining this species (e.g., its consumption of rodents makes it useful in agricultural areas) and to discourage illegal persecution and harassment (Evers 1994). In Michigan, the eastern fox snake is protected by the Michigan Endangered Species Act and the Director's Order No. DFI-166.98, Regulations on the Take of Reptiles and Amphibians, which is administered by the Michigan Department of Natural Resources' Bureau of Fisheries. It is unlawful to take an eastern fox snake from the wild except as authorized under a permit from the Director (legislated by Act 165 of the Public Acts of 1929, as amended, Sec.302.1c (1) and 302.1c (2) of the Michigan Compiled Laws). Public land managers and the general public should be informed that this species is protected and should not be collected or harmed. Any suspected illegal collection of eastern fox snakes should be reported to local authorities, conservation officers, or wildlife biologists.

Research needs: An assessment of the species' current distribution and abundance in the state is needed. More information on this species' life history, particularly its habitat requirements, activity patterns, home range, dispersal capability and reproductive biology, should be obtained to develop appropriate management recommendations. The species' distribution and associated habitat should be analyzed at a landscape-scale to help determine habitat requirements and assess connectivity among populations. Long-term population studies including viability analyses are needed to better understand fox snake population dynamics and to identify parameters that determine and indicate population viability. This information would be useful for developing effective monitoring protocols and assessing this species' status in the state. The effectiveness of current methods for detecting and monitoring this species should be evaluated, and alternative survey methods investigated if current methods are not effective or yield inconsistent or unreliable results. Impacts of management and land use practices such as mowing, prescribed burning and residential development should be further investigated. The need and potential for successfully relocating, reintroducing or headstarting individuals in order to conserve or increase wild populations of this species should be investigated. The genetic diversity of extant populations needs to be examined. Effective methods to educate the public also need to be researched and implemented.

Related abstracts: eastern massasauga, Great Lakes marsh, eastern prairie fringed orchid

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