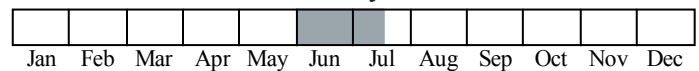


Best Survey Period



Status: State special concern

Global and state rank: G5T5/S3

Family: Emydidae (pond and box turtle family)

Range: The eastern box turtle occurs from Ne. Massachusetts to Georgia, and west to Michigan, Illinois, and Tennessee. The subspecies *Terrapene c. triunguis* (three-toed box turtle) ranges from Missouri to Texas and south central Alabama. *Terrapene c. major* (Gulf Coast box turtle) occurs along the Gulf Coast region of Florida and southern Louisiana and *Terrapene c. bauri* (Florida box turtle) occurs in the Florida peninsula and in some of the Keys. The various races of *Terrapene carolina* intergrade with one another where their ranges come in contact (Conant and Collins 1998).

State distribution: Historically eastern box turtles have been found in the southern and western Lower Peninsula in 31 counties. They are locally common in the southwestern counties but are rare throughout the rest of their former Michigan range. In the past ten years the eastern box turtle has been reported in 20 counties including Allegan, Barry, Berrien, Calhoun, Cass, Clare, Jackson, Kalamazoo, Kent, Lake, Manistee, Mason, Muskegon, Newaygo, Oakland, Oceana, St. Clair, St. Joseph, VanBuren, and Washtenaw counties.

Recognition: The eastern box turtle is a small land turtle with a **high-domed carapace** (upper part of shell) and a **hinged plastron** (bottom part of shell) which allows it to close its shell tightly and hide its head, legs and tail. The carapace has a **slight keel** (raised ridge) along the midline

and ranges from 4.6 to 7.8 inches (11.8 to 19.8 cm) in length. It is **brown or black with a highly variable pattern of yellow or orange markings within each scute** (a large scale or plate). The plastron can be yellowish, brown or black and is either plain or marked with blotches or lines. Males are usually larger and more brightly colored than females, often have reddish or pinkish eyes (brown in females) and have a concave plastron (flat or slightly convex in females). The skin of the head and legs is usually dark with yellow streaks and spots, although in some individuals (especially males) the yellow or orange can cover most of the head and forelimbs. There are four toes on each hind foot and the tail is quite short. Hatchling turtles have a much flatter shell than adults and are mostly grayish brown with a spot of yellow on each large scute (hatchling spotted turtles (*Clemmys guttata*) have a blacker shell). Other adult Michigan turtles of similar size or shape to the eastern box turtle are the wood (*Clemmys insculpta*) and Blanding's (*Emydoidea blandingii*). The wood turtle has a flatter carapace, usually with characteristic roughly grooved circular growth rings, and its plastron lacks a hinge. The larger Blanding's turtle has a domed carapace that is elongated, smooth and unkeeled, with a profusion of light dots. It also has a bright yellow chin that contrasts strongly with its dark head (Harding 1997).

Best survey time: Box turtles can be seen anytime between April and October, although most sightings coincide with egg laying, which occurs from early June through mid July. Weather is a more predictable factor than time of year in determining turtle activity as they are often found the morning after a rainstorm, otherwise spending much time buried under leaf litter, brush piles and rotting



logs (Harding 1997).

Habitat: The eastern box turtle is Michigan's only truly terrestrial turtle. It typically occurs in forested habitats with sandy soils near a source of water such as a stream, pond, lake, marsh or swamp (Tinkle et al. 1979). They also may be found in adjacent thickets, old fields, pastures, vegetated dunes, marshes and at bog edges. Access to unshaded nesting sites in sandy, open areas, is critical for successful reproduction.

Biology: The box turtle's annual cycle begins in April and ends in October. Mating generally occurs soon after the turtles emerge from their hibernacula in April but may also occur in summer and fall. Egg laying usually takes place in the evening from early June until the middle of July, with 3 to 11 leathery shelled eggs being buried often in an open elevated location. Incubation requires 50 to 90 days with hatching typically occurring in September or October. Hatchlings are rarely seen as they spend most of their time hiding under forest debris.

Box turtles dig into the soil at the onset of cool weather, digging deeper as temperatures decline. The most common night and winter retreat is a cavity constructed by the turtle in leaves, debris or soil. Some individuals move about in the winter and may leave their hibernacula in the spring well before the last frost (Claussen et al. 1991), although some turtles die when early spring thaws are followed by a return to severe cold (Harding 1997). Box turtles exhibit a high degree of natural freeze tolerance and have been shown in laboratory studies to survive the freezing of 58% of their body water for up to 72 hours without injury (Costanzo and Claussen 1990).

Box turtles are diurnal and most active in the spring and fall. In the summer they may have a brief activity period in the morning, or following moderate to heavy rain showers (Harding 1997). Stickel (1950) found that weather conditions most favorable to turtle activity are high humidity, warm sunny days, and frequent rains. In hot weather box turtles will soak at the edges of ponds and streams, yet avoid deep water since they are generally poor swimmers (Harding and Holman 1990). During the heat of midsummer they may congregate in mudholes, burrow in the mud in marshy areas (Smith 1961) or burrow beneath logs or rotting vegetation (Conant and Collins 1998). Sunning takes place in forest openings with protective cover nearby. Turtles not actively moving about are usually found using habitat cover of brush piles or tangles of vines and briars.

Typical home ranges are small, ranging from 3.7 to 40 acres, although males wander widely which may help to maintain genetic diversity within and between populations (Harding 1997).

It is estimated that nest mortality in Michigan box turtle populations ranges between 70% to 100% and juvenile mortality is thought to be nearly as high (Harding 1999).

Skunks, raccoons and foxes prey on box turtle eggs; smaller juvenile turtles are vulnerable to these mammals as well as shrews, birds and snakes. The plastral hinge is not functional in very young turtles but they can give off a strong odor that may act to deter predators (Harding 1997). The young are largely carnivorous and eat mostly insects, earthworms and other invertebrates, yet take more plant foods as they grow. Adults are omnivorous eating a great variety of plants, insects, worms, slugs, snails, carrion, mushrooms, berries and fruit. Sexual maturity in females is usually not reached until they are 10 years old. Eastern box turtles are reported to have lived over a century although the average lifespan is thought to be 50 years with individuals rarely living past 80 years. It is possible to estimate a growing turtle's age by counting the growth rings on the scutes of the plastron. Estimates beyond the age of 20 are unreliable since most turtles have stopped growing by this age and the plastron is often worn smooth (Stickel 1978).

Conservation/management: Harding (1997) cites the rapid conversion of woodlands and wetlands into agricultural land over the past century as the primary cause for the elimination of the box turtle from much of its former range. The present spread of suburban development continues to fragment habitat and isolate the remaining populations, in addition to increasing their vulnerability to road mortality. Demand for box turtles in the domestic and international pet trade has encouraged poaching and has contributed to the depletion of their populations (Harding 1997). In 1994 the box turtle was added to Appendix II in CITES (The Convention on International Trade in Endangered Species of Wild Fauna and Flora). This prevents unauthorized exports of box turtles and more closely regulates commercial trade to help prevent them from becoming threatened (Liebermann 1994). In Michigan, under the Director's Order No. DFI-166.98, Regulations on the Take of Reptiles and Amphibians, it is unlawful to take a box turtle 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). Harding (1997) believes that these laws offer some important protection, but fail to protect box turtles from their worst enemies, bulldozers and automobiles. There is much concern that the high rates of nest predation and juvenile mortality in Michigan coupled with the number of adults killed on roads, and the time it takes for turtles to reach sexual maturity, dim the long term outlook for the box turtle (Harding 1999). Conservation efforts should concentrate on protecting large tracts of habitat on public land to provide the box turtle additional protection from the effects of development (Tinkle 1979). Wetland hydrology and quality should be maintained by preventing improper off road vehicle (ORV) use and controlling invasive weeds in these areas. Upland nesting areas should be identified, protected and in some cases created. New roads should be routed to avoid separating the turtle's habitat from nesting areas (Harding 1999). Finally, the local public should be



educated about the laws protecting reptiles and amphibians and encouraged to leave wild turtles in their natural habitats rather than collecting them for pets.

Research needs: Additional surveys are needed to locate box turtle populations and important nesting areas so they can be adequately protected. Studies should focus on understanding population structure and determining the factors that contribute to population viability (Harding 1999).

Related abstracts: Blanding's turtle, eastern massasauga

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