Regina septemvittata Say, 1825 — Queen snake

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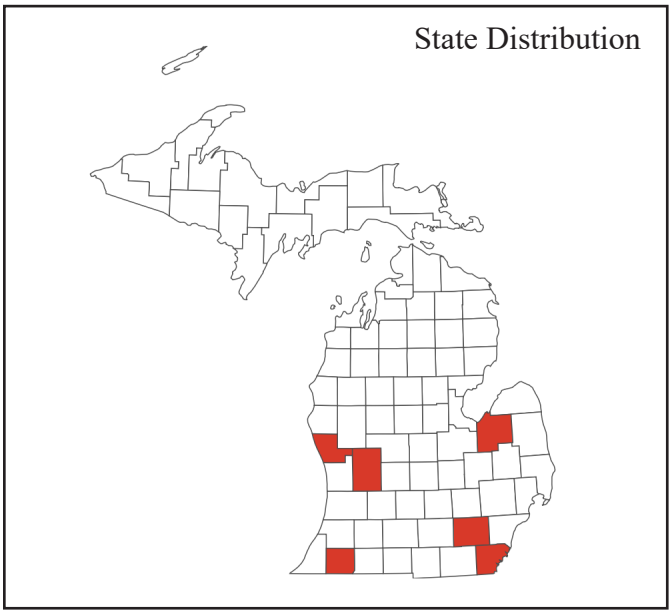

Best Survey Period

Status: State special concern

Global and state rank: G5 (Secure) / S2S3 (Imperiled/vulnerable)

Other common name(s): Queensnake

Family: Colubridae

Synonyms: *Coluber septemvittatus* (Say, 1825), *Natrix septemvittata* (Say, 1825)

Total Range: The range extends from the southern Great Lakes region (southeastern Wisconsin, northeastern Illinois, Michigan, southern Ontario, and western New York) south to the Gulf Coast of the Florida panhandle, east to southeastern Pennsylvania, western New Jersey, and northern Delmarva Peninsula, and west to Missouri (extirpated, Johnson 2000) and Arkansas (Barbour 1971, Mount 1975, Phillips et al., 1999, Hulse et al., 2001, Ernst, 2002, Ernst and Ernst, 2003, Gibbons and Dorcas, 2004, Harding and Mifsud 2017, NatureServe 2025).

State Distribution: This species occurs primarily in the southern and western portions of Michigan's Lower Peninsula (with isolated populations in the northeastern Lower Peninsula) (Harding and Mifsud 2017), Occurrences have been reported from Cass, Kent, Monroe, Muskegon, Tuscola, and Washtenaw counties (Michigan Natural Features Inventory [MNFI] 2025). However, the true extent and distribution of this species within the state remain unknown as systematic surveys for this species have not been conducted in the state.

Recognition: The queen snake is a relatively small, slender species, ranging in size from 34 - 92 cm (13.4 – 36.3 in) (Harding and Mifsud 2017). The scales are keeled (i.e., have a lengthwise ridge along the top of each scale), giving the species an overall rough texture. Their **color may vary from tan or olive to dark brown or black, with a ventral surface or belly color of yellow to cream**, which extends onto the lower jaw and down the length of each side of the body on the second scale row and upper half of the first scale row. **Two broad, brown stripes running the length of the body** cover the sutures of the **first scale row and the outer margins of the ventral scales**. There are also **two brown lengthwise stripes along the**

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center of the belly that may become intertwined or obscured towards the tail. Three dark dorsal stripes may be visible on adults in some localities, and on juveniles that may fade as the animal reaches maturity. The head is relatively narrow, with nine large, plate-like scales on top and thicker scales on the chin, which provide protection when hunting under rocks. Queen snakes have rounded pupils. Unlike similar-looking species like eastern garter snakes and northern ribbon snakes, queen snakes have a divided anal plate and lack a light dorsal stripe.

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Best survey time/phenology: Although queen snakes can be observed anytime during the active season (April to October/early November), the best way to survey for this species is to conduct visual encounter surveys in late April through June when the snakes are most active and most visible (Ontario Ministry of Natural Resources and Forestry [OMNRF] 2015). Visual surveys should consist ideally of multiple surveyors walking through suitable habitat looking for individuals basking in shrubs or trees, foraging, or hiding under cover objects along the shoreline (i.e., within 5 m [16 ft] of the shoreline) (OMNRF 2015). Queen snakes are often found basking on artificially created dikes, muskrat houses, rocks, or other elevated sites. Recommended survey conditions for visual surveys include sunny/partly sunny days when air temperature is above 12°C (54°F) and below 30°C (86°F) (OMNRF 2015). Coverboard surveys also can be conducted in conjunction with visual surveys. These would consist of placing coverboards in areas with suitable habitat and turning over the boards during the day and looking for snakes under the boards. Coverboard surveys can be conducted from mid-late April to late September.

Habitat: Queen snakes require moving water and are usually found along streams and rivers, particularly those with limestone, slate and other rocky substrates and abundant crayfish (Wood 1949, Triplehorn 1949, Ernst and Ernst 2003, Harding and Mifsud 2017). They also inhabit the edges of ponds, lakes, marshes, ditches, and canals (Harding and Mifsud 2017). Warm, shallow streams with shrubs and trees nearby are the preferred habitat (Harding and Mifsud 2017). Queen snakes typically bask, forage, or hide in or under aquatic plants, overhanging shrubs, woody debris, or rocks at the water's edge (Harding and Mifsud 2017). If disturbed, they dive into water and either hide near the bottom or swim along the shore for a short distance before re-emerging (Harding and Mifsud 2017).

Biology: Queen snakes are active from April or early May until late September, October, or early November, depending on local weather conditions (Ernst and Ernst 2003, Harding and Mifsud 2017). They are diurnal and spend much of the day concealed beneath flat rocks or woody debris on the shoreline. The water temperature must be a minimum of 10°C (50°F) during the snake's active months and this is in large part due to the snake's dietary requirements (Jackrel 2011). They subsist almost entirely on freshwater crayfish, with studies indicating that crayfish make up over 90% of the snake's diet, particularly freshly molted crayfish (Jackrel 2011). Queen snakes are especially sensitive to a chemical compound called ecdysone that is produced by crayfish during their molting cycle which helps queen snakes find crayfish easier (Tennant 2003). Other sources of food include frogs, tadpoles, newts, salamanders, minnows, snails, and fairy shrimp (Jackrel 2011). The few reported predators of queen snakes are great blue herons, large fish, and ophiophagous snakes (kingsnakes and racers), though it is often suggested that other wading birds, predatory birds, and carnivorous mammals also likely prey on this species

(Branson and Baker 1974, Palmer and Braswell 1995, Ernst and Ernst 2003, Gibbons and Dorcas 2004).

Queen snakes are very alert to any potential danger and will drop into the water when disturbed. Their main defenses are thrashing, spinning, and secreting malodorous feces and anal musk. Queen snakes have been shown to use the sun for celestial orientation in their habitat (Newcomer 1974).

Female and male queen snakes reach sexual maturity at three and two years of age, respectively (Vogt 1981). Breeding takes place primarily in the spring (most often in May) but breeding also occurs during autumn months. If mating occurs in the fall, the female can delay giving birth until spring, storing the energy she will need through brumation This snake is ovoviviparous, with the female giving birth to live young after carrying the eggs within her body. Litter size can vary from 5 to 23, averaging 12 (Logier 1958, Triplehorn 1949).

The newborn snakes are approximately 12.5-18.1 cm (5-7 in) in SVL and 2.9 g (range from 2.7-3.1 g) (Ernst 2003). Newborn snakes grow very rapidly and may shed their skin twice in their first week while living on nutrient rich yolk stores (Ernst 2003). They can move, swim, and must fend for themselves immediately after birth. Juvenile queen snakes range from 17.5 to 23 cm (7-9 in) in length (Behler and King 1979, Ashton and Ashton 1981).

A suitable hibernation site is critical for survival during their overwintering period (Bauchot 1994, Mattison 1995). Queen snakes may hibernate in muskrat lodges, crayfish burrows, and earthen and stone dams (Gibbs et al 2007). In Ontario, one communal hibernation site occurred in a seepage area on an open south–facing clay slope above the river's high-water mark; small mammal burrows were present which provided access to the hibernaculum (Gillingwater 2011). Further research at this site in 2009 has also identified access points at the base of woody vegetation (Gillingwater 2011). The species appears to hibernate communally and is thought to use anthropogenic structures such as bridge abutments and cracks in rock outcrops in urban environments (Campbell and Perrin 1979).

Few data exist on queen snake dispersal as no radio–telemetry studies have been conducted on the species to date. Localized distribution along certain stretches of stream, and complete absence from others, implies that queen snakes generally do not move far (COSWIC 2010). Their close association with water and their permeable skins may make queen snakes reluctant to move inland and disperse across watershed boundaries (Stokes 1982). Living on rivers with currents and regular floods, however, has the potential for carrying some individuals downstream for considerable distances within watersheds and some "dispersal" may occur that way.

Branson and Baker (1974) conducted a mark–recapture study and found that queen snakes had small home ranges. Most individuals did not move more than 30 m from their original point of capture, although one individual moved 122 m (400 ft) in 2 weeks. At one Ontario site on the Thames River, movements of 100 m (328 ft) have been observed between hibernation and gestation sites (COSWIC 2010).

Conservation/management: Threats and declines appear to be greatest in the northern or peripheral parts of the range where habitat alteration has negatively affected crayfish populations (Gibbons and Dorcas 2004). Water pollution, acid rain, and drainage of wetlands have reduced crayfish populations in many parts of the eastern portion of the snake's range, and have eliminated the queen snake from many areas where it was once common (Ernst and Ernst 2003). In the Great Lakes region, siltation from urban or agricultural runoff may reduce or eliminate crayfish populations (Harding and Mifsud 2017). Other potential threats include stream channelization and large impoundments (Mitchell 1994). Invasive crayfish species such as the rusty crayfish (*Orconectes rusticus*) can displace and reduce native crayfish prey that are preferred by queen snakes (Harding and Mifsud 2017). Road

mortality also is a threat to queen snakes at some sites.

Protecting extant populations of queen snakes and maintaining suitable habitat and an abundant prey base at these sites are essential for conservation of this species. Maintaining vegetated buffers along streams, rivers, and other waterbodies with trees and shrubs for basking as well as aquatic plants, woody debris, and rocks for foraging, thermoregulation, overwintering, and/or refugia from predators would protect suitable habitat for queen snakes and their crayfish prey. Retaining or restoring natural riparian buffers also would reduce the runoff of pollutants and nutrients and help maintain or improve water quality in aquatic habitats for queen snakes and crayfish. Minimizing exposure to highly acidic conditions and/or chemical pollutants would avoid or reduce the potential for adverse impacts to this species until more is known about their potential impacts. Conducting habitat management or disturbance activities (e.g., mowing, shrub removal) in riparian habitats during the inactive season or when the species is less active (e.g., above 27-29°C [80-85°F]) would reduce the potential for adverse impacts to queen snakes. Conserving native crayfish species and preventing or controlling the spread and abundance of invasive crayfish would help maintain sufficient crayfish prey for queen snakes.

Research needs: Area of occupancy, number of subpopulations, and population size appear to have declined in some parts of the range (Ernst and Ernst 2003), but the degree of decline is unknown. In the Great Lakes region, numbers have declined in many places due largely to habitat degradation; this species is now scarce or absent in many streams that once harbored healthy populations (Harding and Mifsud 2017). An assessment of the species' current distribution and abundance in the state is needed. More information on this species' life history and ecology, particularly its home range and dispersal capability, should be attained 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. This information would be useful for developing effective monitoring protocols and assessing this species' status in the state. The genetic diversity of extant populations needs to be examined within the state as well. Additional information also is needed on the queen snakes' primary crayfish prey species and their distribution, abundance, ecology, and limiting factors.

Related abstracts: Blanchard's cricket frog, smallmouthed salamander, mudpuppy, spotted turtle, Kirtland's snake, copper-bellied water snake, Blanding's turtle, wood turtle, eastern box turtle, calico crayfish, osprey, Louisiana waterthrush, prothonotary warbler, cerulean warbler, slippershell, purple wartyback, snuffbox, floodplain forest, southern hardwood swamp, northern shrub thicket

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