Opheodrys vernalis Harlan, 1827 — Smooth Green Snake

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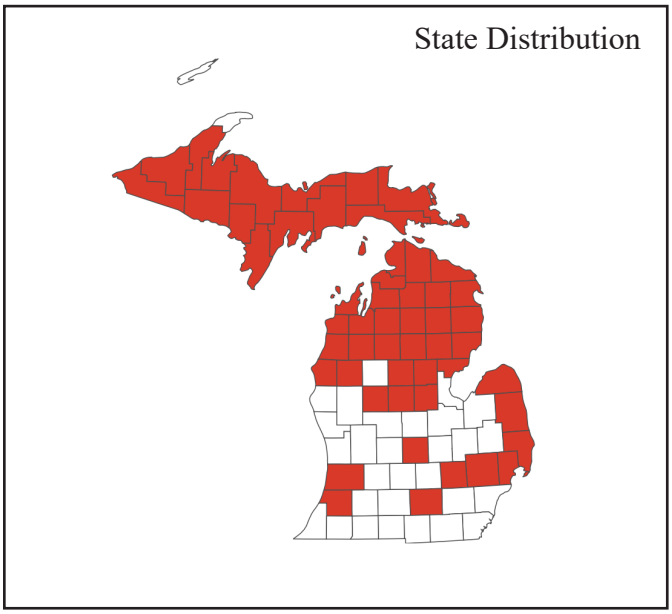

Best Survey Period

Status: State special concern

Global and state rank: G5 (Globally secure)/S3 (State vulnerable)

Other common name: Smooth Greensnake

Family: Colubridae

Synonyms: *Liochlorophis vernalis* (Oldham and Smith, 1991). Previous synonyms/scientific names not currently in use include *Coluber vernalis* (Harlan, 1827), *Chlorosoma vernalis* (Baird and Girard, 1853), *Herpetodryas vernalis* (Hallowell, 1856), *Cyclophis vernalis* Gunther, 1858), *Liopeltis vernalis* (Cope, 1860), *Contia vernalis* (Boulenger, 1894), *Eurypholis vernalis* (Pope, 1935)

Taxonomy: Oldham and Smith (1991) reported several significant differences between the northern rough green snake (*Opheodrys aestivus*) and the smooth green snake (*O. vernalis)*, which indicated a long history of divergent evolution, and assigned the smooth green snake to a new genus (*Liochlorophis*), leaving *aestivus* as the only member of the genus *Opheodrys* (NatureServe 2025). However, Crother et al. (2000) and Crother (2008, 2012) maintained *vernalis* in the genus *Opheodrys*, based on unpublished genetic data indicating a sister-taxa relationship between *vernalis* and *aestivus* and their preference not to recognize monotypic sister genera (i.e., two distinct but closely related genera, where one genus contains only a single species) (NatureServe 2025).

Total Range: The smooth green snake can be found in parts of Canada from Nova Scota west to Ontario, and parts of Saskatchewan and Manitoba. In the Unites States, this species resides in most of the Great Lakes basin, except north of Lake Superior, northeastern Indiana, and northwestern Ohio (Harding and Mifsud 2017). Its range extends from Michigan, Wisconsin, and Minnesota-South to northwestern Illinois, northeastern Ohio, and along the east coast from Maine to Pennsylvania as well as some parts of West Virginia and Virginia (Harding and Mifsud 2017, NatureServe 2025). Small disjunct populations can be found in Iowa, North and South Dakota, Nebraska, Montana, Wyoming, Utah, Colorado, New Mexico, Texas, and western Chihuahua in Mexico (Harding and Mifsud 2017, NatureServe 2025.

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State Distribution: This species has been documented in every county in the Upper Peninsula except Keweenaw, as well as on Drummond, Bois Blanc, and Beaver islands (MNFI 2025). It is widespread in the northern half of the Lower Peninsula, but less common in the southern Lower Peninsula with only scattered records in counties such as Allegan, Clinton, Huron, Jackson, Macomb, Oakland, Sanilac, St. Clair, and Van Buren (MNFI 2025).

Recognition: The smooth green snake is the only snake in Michigan and the Great Lakes region that is bright green on its entire upper surface and sides (Redder et al. 2006, Harding and Mifsud 2017). Adults are small and slender with a head that is slightly wider than the body, often with yellow to white labial (lip) scales, chin, and throat (Holman 2012, Harding and Mifsud 2017). The belly ranges in color from white to pale yellow. Scales are smooth (i.e., unkeeled), and the anal plate is divided (Redder et al. 2006, Harding and Mifsud 2017). Some adults have been observed to be light brown, tan, or bronze instead of green (Harding and Mifsud 2017). Total adult lengths range from 30-66 cm (11.8-26 in; Harding and Mifsud 2017).

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Smooth green snakes can occasionally look similar to other snake species in Michigan. After smooth green snakes die, their green color fades due to the breakdown of the yellow pigments and they can appear blue in color. Blue racers (*Coluber constrictor foxi*) are blue or blue gray in color, but they have large eyes and a distinct brow ridge, and adult blue racers are typically larger than adult smooth green snakes (Harding and Mifsud 2017). Young blue racers tend to be similar in size to smooth green snakes but have dark blotches. Dekay's brown snake (*Storeria dekayi*) are brown or tan in color but have two parallel rows of dark spots on their back and keeled scales (i.e., each scale has a small ridge in the center) (Harding and Mifsud 2017).

Best survey time/phenology: The best time to survey for this species is during the active season, May to September, but it has been reported or observed more frequently in August than other parts of the summer in parts of its range (Wright & Wright 1957). Both visual encounter and artificial cover surveys are recommended for this species. Visual surveys should be conducted in suitable habitats by walking slowly and looking for movement in the grass, checking under cover such as logs or rocks, or observing individuals out basking.

Artificial cover surveys consist of placing and looking for snakes under cover boards made from plywood, tin, carpet, or other materials. Cover boards should be placed flat on the ground and can be checked anytime during the active season. Adult smooth green snakes have been found more commonly under cover in May, while hatchlings have been found under cover primarily in September and October (Sacerdote-Velat & King 2022). Artificial cover surveys can be especially effective in July when greensnakes use the cover boards for nesting (Sacerdote-Velate & King 2022).

Habitat: The smooth green snake inhabits a variety of grassy habitats that are typically moist. These include meadows, marsh borders, old fields, pastures, and open deciduous or pine woodlands (Ernst & Ernst 2003, Holoman 2012). Most com-

monly found under cover, these snakes tend to hide under logs, bark, leaves, or human debris such as flat boards (Holoman 2012). They lay their eggs in rotting wood, underground in burrows, or under logs, rocks, boards or other similar cover. Snakes also have been documented using rubber mats, chipboard, asphalt, and corrugated fiberglass for thermal refugia (Sacerdote-Velat & King 2022).

Ecology: Smooth green snakes are most active from May to September, with some in southern Michigan emerging in late April and hibernating in October (Holoman 2012). They are often found hibernating in ant mounds, mammal burrows, and gravel pits, often communally with other snake species (Gregory 1977).

The smooth green snake is largely insectivorous with much of their diet consisting of caterpillars, spiders, ants, and grasshoppers (Judd 1960, Redder et al. 2006). They will occasionally eat other arthropods such as fly larvae, centipedes, millipedes, earthworms, slugs, snails as well as salamanders depending on seasonal changes and availability (Ernst & Ernst 2003, Redder et al. 2006). In Michigan, smooth green-snakes showed a preference for noctuid moth caterpillars (cutworms) when abundant (Waters 1993).

Breeding is most common in mid- to late summer but has been observed as early as April 15th in Pennsylvania, and as late as mid- August in Canada (Dymond & Fry 1932, Ernst & Ernst 2003). Sexual maturity for females is reached when total body length is 30 to 65 cm (11.8-25.6 in), and for males when total body length is between 28 and 57.5 cm (11 and 22.6 in; Wright & Wright 1957).

Nesting occurs from early June to late August in Michigan but can vary from July to mid-September in northern sections of their range (Blanchard 1933, Wright & Wright 1957). Smooth green snakes lay a clutch of 3 to 12 eggs (average 7.4), which are cylindrical, thin, and blunt-ended with an almost parchment-like shell (Blanchard 1933). Eggs range from 20 to 30 mm (0.8-1.2 in) in length and 10 to 15 mm (0.4-0.6 in) in diameter (Blanchard 1933). Communal nesting has been observed in smooth green snakes in many parts of their range. In Michigan, 31 eggs were discovered under rotting planks in sandy soil, and it was speculated they were from three or more females (Fowler 1966). In Illinois, a nest of 85 eggs was found containing three separate clusters of 14, 24, and 47 eggs under the bottom layer of a two-layer plywood sheet (Sacerdote et al. 2012). In a northern Illinois prairie, 137 smooth green snake eggs were either found on top of or excavated from an active ant mound (Sacerdote-Velat & Sekits 2023).

Egg incubation in smooth green snakes has been found to only be between 4-23 days. This may be due to the eggs being partially incubated inside the female and are laid in an advanced stage of development (Blanchard 1923, Holoman 2012). Most young hatch from August to mid- September, with the latest hatching recorded on October 5th (Wright & Wright 1957). Young and newly hatched green snakes tend to be less vibrant in coloration, varying from light brown and yellow green, to slate gray (Wright & Wright 1957). Average lengths of young/newly hatched snakes range from 10-17 cm (4 – 6.6 in) (Wright & Wright 1957).

Conservation/management: Smooth green snakes are highly vulnerable to disturbance due to their small size, small clutch size, short life span, and highly localized populations (Redder et al. 2006). Because smooth green snakes have a high dispersal rate, road mortality has become a major threat (Wright & Wright 1957, Redder et al. 2006). Heavily traveled roads in proximity to overwintering dens have become of greater concern due to higher risk of snakes getting hit by vehicles while moving to and from the dens (Redder et al. 2006). Local populations can also be greatly affected by resource extraction, such as mining and logging (Redder et al. 2006). These activities can cause direct mortality or injury of snakes as well as habitat loss and fragmentation that disrupt movement patterns, resulting in a decrease in gene flow and/or inability to move to or from overwintering den sites (Redder et

al. 2006). Hydrological alterations, such as draining wetlands, lowering water levels, and reducing soil moisture, could result in snake mortality from desiccation and/or freezing during hibernation given their reliance on mesic areas (Redder et al. 2006). Fire suppression has caused habitat loss or degradation due to woody encroachment of open, grassy habitats utilized by smooth green snakes. The use of prescribed fire in occupied habitats can enhance or restore habitat for this species but also has the potential to cause snake mortality and/or injury.

Additionally, smooth green snakes are insectivorous, and the use of insecticides has detrimental effects on prey density and survivability of the species (Redder et al. 2006). Any change in insect biomass can result in the death or starvation of smooth green snakes, and reduced fitness due to smaller and/or fewer clutches of eggs (Redder et al. 2006). Consumption of contaminated prey also can lead to serious physiological and behavioral problems (Redder et al. 2006).

Protection and maintenance of suitable habitat within occupied sites are especially important for conservation of smooth green snakes (Redder et al. 2006). Conducting habitat management activities (e.g., prescribed fire, forest management using heavy equipment) during the species' inactive season (November-March) and/or leaving some refugia within occupied sites would avoid or reduce the potential for adverse impacts on this species. Increasing dispersal corridors between smooth green snake habitats, protecting occupied or suitable hibernacula and nesting sites, carefully considering and minimizing or prohibiting the use of pesticides and herbicides in occupied habitats, and taking precautions to reduce the spread of disease (e.g., snake fungal disease), such as decontaminating footwear and equipment/supplies between sites, are crucial for the survival of the species (Redder et al. 2006).

Research needs: Additional surveys and research are needed to better understand the status and distribution of smooth green snakes and the threats facing the species and individual populations in Michigan. Targeted surveys for the species should be conducted throughout the state to assess the species' current distribution. Artificial coverboards could be deployed in the spring to maximize detectability throughout the active season as well as variations in time of day (Sacerdote-Velat & King 2022). To fully understand the status of the species and its populations in the state, mark-recapture and radio-telemetry studies should be conducted at a subset of extant populations to obtain abundance estimates and information on habitat use/requirements, life history, movement/dispersal distances and behavior, and corridors that can provide connectivity within and between populations (Redder et al. 2006). Research to identify specific threats and management needed at individual populations also is needed as threats can vary by habitat type (Redder et al. 2006).

Related abstracts: eastern massasauga rattlesnake, eastern fox snake, Butler's garter snake, Blanding's turtle, wood turtle, spotted turtle, eastern box turtle, pickerel frog, Kirtland's warbler, short-eared owl, red-shouldered hawk, prairie warbler, secretive locust, dusted skipper, blazing star borer, bog, coastal fen, coastal plain marsh, dry-mesic northern forest, mesic northern forest, dry-mesic southern forest, mesic southern forest, intermittent wetland, lakeplain wet prairie, lakeplain wet-mesic prairie, muskeg, northern fen, northern wet meadow, oak-pine barrens, pine barrens, patterned fen, prairie fen, rich tamarack swamp, southern wet meadow, wet prairie, wet-mesic prairie, wet-mesic sand prairie

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