Eastern Ribbonsnake (*Thamnophis sauritus*) Species Guidance

Formerly known as the northern ribbonsnake (*Thamnophis sauritus septentrionalis*)
Family: Colubridae

State Status: Endangered (1979)

State Rank: S1

Federal Status: None

Global Rank: G5

Wildlife Action Plan Mean Risk Score: 3.7

Wildlife Action Plan Area Importance Score: 2

Counties with documented locations of eastern ribbonsnakes in Wisconsin. Source: Natural Heritage Inventory Database, February 2013.

Rori Paloski, Wisconsin DNR

Species Information

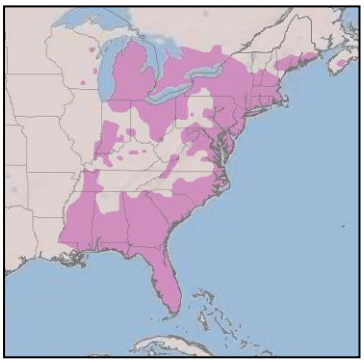
General Description: The eastern ribbonsnake is the smaller of Wisconsin's two ribbonsnake species. It has a very slim body with one lateral stripe on each side of the body, one ventral stripe, and a very long tail comprising approximately 40% of the total body length (Rossman et al. 1996). Each lateral stripe is a yellow, greenish/yellow, or white color against a dark brown or black background and is located on scale rows three and four (19 scale rows at mid body). Below each lateral stripe is a brown ventrolateral stripe (a lighter brown stripe extending from scale rows 1 and 2 onto the ventral scales; Harding 1997). Ventral scale counts of eastern ribbonsnakes range from 143-177 with an undivided anal plate (Ernst and Ernst 2003). Ribbonsnakes have seven to eight supralabial scales (scales that border the mouth opening along the upper jaw), eight-11 infralabial scales (scales that border the mouth opening along the lower jaw), and lack marking or barring on both sets of labial scales (Rossman 1962, Ernst and Ernst 2003). The ribbonsnake's head is short for a gartersnake. Light parietal spots (white to yellowish spots on the parietal scales on the back of the head) may or may not be present, but if they are present they are rarely fused (Rossman 1963). A white vertical bar lines the front of the eye (Harding 1997). Individuals may vary in these characteristics, and some may differ slightly from this general description.

Similar Species: The species in Wisconsin most similar to the eastern ribbonsnake is the western ribbonsnake (*Thamnophis proximus*). The western ribbonsnake is typically slightly larger, has eight supralabial scales, and often has fused parietal spots on the head. The ribbonsnakes are considered gartersnakes; three other gartersnake species found in Wisconsin may also resemble the eastern ribbonsnake. The plains gartersnake (*Thamnophis radix*), Butler's gartersnake (*Thamnophis butleri*), and common gartersnake (*Thamnophis sirtalis*) all lack the white edging on the front of the eye, typically has marking or barring on the labial scales, and are not as slender. Among Wisconsin gartersnakes, only the eastern ribbonsnake and the plains gartersnake have lateral stripes located on scale rows 3 and 4. Non-ribbonsnake gartersnakes' supralabial scale counts range from five to eight per side.

Associated Species: The eastern ribbonsnake can be strongly associated with the common gartersnake and the Butler's gartersnake where appropriate habitat is present (Carpenter 1952). Other species strongly associated with the ribbonsnake are prey (e.g., spring peepers [*Pseudacris crucifer*], boreal chorus frog [*Pseudacris maculata*], green frog [*Lithobates clamitans*], northern leopard frog [*Lithobates pipiens*], wood frog [*Lithobates sylvaticus*], pickerel frog [*Lithobates palustris*]) and predators (e.g., herons, hawks, mink, raccoons [*Procyon lotor*]).

State Distribution and Abundance: Relict eastern ribbonsnakes populations have been recorded in eastern and southern Wisconsin. Distribution information for this species may not reflect its full extent in Wisconsin because many areas of the state have not been thoroughly surveyed.

Global Distribution and Abundance: The four eastern ribbonsnake subspecies span an area from northern Nova Scotia and southern Maine west to southern Ontario, Michigan, and Wisconsin (Rossman, 1963). Ribbonsnakes southeast of the Mississippi river range from southeast Louisiana to the Florida Keys (Ernst and Ernst 2003).



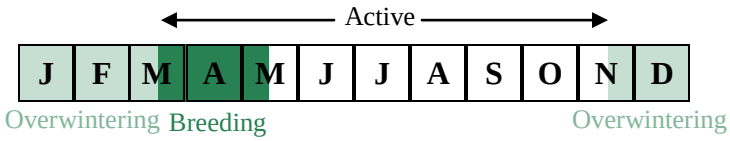
Global range map for the eastern ribbonsnake. (NatureServe 2013)

Diet: Amphibians constitute 90% of the eastern ribbonsnake's diet, followed by fish, and caterpillars (Carpenter 1952). Carpenter (1952) observed smaller ribbonsnakes have a tendency to consume smaller amphibians (e.g., spring peeper, southern chorus frog [*Pseudacris nigrita*]),

whereas larger snakes feed more frequently on larger amphibians (e.g., green frog, northern leopard frog, wood frog, pickerel frog). Insects (Hamilton 1956) and earthworms (Surface 1906) have also been found in ribbonsnake stomachs.

Reproductive Cycle: Eastern ribbonsnakes are ovoviviparous (eggs are retained in the female until they hatch; Surface 1906), and some females may skip years between reproduction (Burt 1928, Carpenter 1952). Females reach sexual maturity around two to three years with a snout-to-vent-length of 42 cm (Carpenter 1952). Clutch size averages of six (Burt 1928), 10 (Carpenter 1952), and 12.2 (Rossman 1963) have been observed, and the range is three to 26 (Harding 1997). Very little research has focused on eastern ribbonsnakes in Wisconsin, but gravid females in Michigan have first been observed in May (Carpenter 1952) and continued observations occur from June to September in Nova Scotia (Bell et al. 2007). Some gravid females in Indiana have been found very early in the year, potentially indicating an early spring or fall breeding season (Minton 1972). A fall breeding season has not yet been observed in eastern ribbonsnakes, although it has been documented for other gartersnake species (Bell et al. 2007). Neonate ribbonsnakes have been observed in Nova Scotia beginning in August (Bell et al. 2007) and parturition dates have been recorded from July 2-October 4 (Rossman 1963). Neonates range between 165-239 mm long and resemble adults in color and pattern (Minton 1972). Young ribbonsnakes have been observed near marsh margins and beneath bushes (Carpenter 1952), and adults have been observed swallowing young for protection and permitting them to escape afterwards (Surface 1906).

Ecology: The eastern ribbonsnake is rare in this region, and information about its natural history in Wisconsin is scarce. Understanding of eastern ribbonsnake ecology, therefore, comes largely from research conducted elsewhere. Eastern ribbonsnakes are diurnal but may forage at night during frogs' breeding seasons (Rosen 1991, Ernst et al. 1997). Behavioral observations of *Thamnophis* species suggest a compensation for low temperature environments by intensifying thermoregulation (Rosen 1991). The eastern ribbonsnake has a preferred body temperature of 30.1° C (Scribner and Weatherhead 1995, Ernst and Ernst 2003). During hot and dry periods ribbonsnakes may estivate (enter a state of torpor) for short periods (Ernst and Ernst 2003). Eastern ribbonsnakes can be found from June to August basking in mud along shorelines or floating in water among aquatic vegetation (Bell et al. 2007). The eastern ribbonsnake has a tail that accounts for over 1/3 of its body length, making this snake similar to arboreal species. It has been observed basking in bushes and low shrubs to maintain body temperature (Carpenter 1952). All eastern ribbonsnakes observed by Bell et al. (2007) from June 1 to August 31 were found within 10 m of water. Eastern ribbonsnakes are typically active from late-March/early-April to mid-October in Indiana (Minton 1972) and show a similar active period in Wisconsin (WDNR 2009). Carpenter (1952) observed a 190-day activity period countered by a 175-day hibernation period in Michigan.



Small eastern ribbonsnakes in Michigan have been observed overwintering in ant hills, and larger snakes were observed using small mammal and crayfish burrows (Carpenter 1953). Carpenter (1953) also observed overwintering sites in burrows with multiple snake and amphibian species. Snakes in Michigan prefer overwintering sites close to the water table, which suggests that they require moisture to successfully overwinter while avoiding desiccation (Carpenter 1953). Hibernacula are generally near feeding grounds and snakes have limited seasonal movements; however, a radio-collared snake in Nova Scotia traveled up to 173 m from shoreline from September through mid-October (Bell et al. 2007). Bell et al. (2007) noted that snakes that traveled longer distances from September through mid-October were located on the floodplain of the lake in the study and only about a meter above the lake level.

Natural Community Associations (WDNR 2005, WDNR 2009):
Significant: bog relict, inland lakes, open bog
Moderate: alder thicket, shrub-carr
Minimal: none

Habitat: Eastern ribbonsnakes prefer vegetation bordering waterways (e.g., brooks, streams, rivers, swamps, marshes, bogs, wet meadows, sloughs, ponds, lakes, pinewoods, ephemeral ponds, floodplains; Gartside 1977, Ernst and Ernst 2003). Rossman (1963) found that associations with water also included swamps and roadside ditches. Eastern ribbonsnakes are endemic to forested or once-forested regions of eastern North America that provide suitable waterways surrounded by bushes (Carpenter 1952). Carpenter (1952) consistently found ribbonsnakes near or in a bush, tree, or similar cover in Michigan. Snakes were found in hawthorn bushes in pastures, and rose and willow bushes in marshes, with a strong affinity for water (Carpenter 1952). Throughout the summer (June 1 – August 31), eastern ribbonsnakes remain within 10 m (33ft) of wetlands and waterbodies. While overwintering and migrating in the spring and fall (September 1 – May 31), eastern ribbonsnakes can be found up to 175 m (574 ft) from wetlands and waterbodies. Overwintering typically occurs in Crayfish burrows, ant mounds and small mammal burrows. This species has been recorded in a wide variety of habitat types throughout its range, but is very rare throughout Wisconsin.

Examples of eastern ribbonsnake habitats in Wisconsin. Emmet Judziewicz, Wisconsin DNR.

Threats: Hydrological alterations by humans and other species (e.g., beavers; Bell et al. 2007) can have negative impacts due to the species' high affinity to water sources. Habitat destruction and roadways also threaten ribbonsnake populations (Klauber 1931, Rossman et al. 1996, Ernst and Ernst 2003). Road contaminants (e.g., oil residues), or particular road substrate types may alter pheromone scent trailing and threaten successful breeding (Shine et al. 2004). Erosion matting can also pose a threat to the eastern ribbonsnake (Kapfer and Paloski 2011), especially if road or bridge work is being conducted around creeks, streams, brooks, ditches, or ephemeral ponds.

Climate Change Impacts: Projected changes in climate include warm dry weather that could reduce soil moisture in wet, boggy areas dominated by trees such as tamaracks, black spruce, and white cedar (WICCI 2011). A reduction in soil moisture and a loss of bogs may negatively affect amphibian populations and eastern ribbonsnake habitat. Amphibians make up a large proportion of the eastern ribbonsnake's diet, so a shift in climate might generate a shift in food selection that will test the adaptive capacity of this species. Less snowfall could also lead to large winter kills of terrestrially overwintering frogs (WICCI 2011). Other areas may experience extreme flooding, which would support the growth of invasive species such as reed canary grass (*Phalaris arundinacea*) (WICCI 2011). Flooding may also create environments hostile to amphibians and thus negatively impact the ribbonsnake's food supply.

Survey Guidelines: Persons handling eastern ribbonsnakes must possess a valid Endangered and Threatened Species Permit. If surveys are being conducted for regulatory purposes, survey protocols and surveyor qualifications must first be approved by the Endangered Resources Review Program (see *Contact Information*). It is very important to note that no survey method is considered 100% effective for determining presence/absence of this very rare species. However, for general information purposes, multiple surveys should be conducted from May-September on partly sunny or sunny days between 10:00 am and 6:00 pm (Lind 2005). At least two surveyors should methodically search stream channels, pond shorelines and banks (Lind 2005). Various trapping techniques such as artificial shelters (e.g., cover boards), pitfall traps, and funnel traps have also proven to be successful with other snakes species and may be effective with the eastern ribbonsnake (Fitch 1987).

Summarize results, including survey dates, times, weather conditions, number of detections, detection locations, and behavioral data and submit via the WDNR online report form: <http://dnr.wi.gov, keyword "rare animal field report form">.

Management Guidelines

The following guidelines describe actions that will help maintain or enhance habitat for the species. These actions are not mandatory unless required by a permit, authorization or approval.

This section provides guidance for maintaining, restoring and enhancing habitat for the eastern ribbonsnake. The habitat management goal for this species is long-term preservation of open-canopy uplands connected to open-canopy wetlands with minimal disturbance.

Upland Habitat: A light but consistent (e.g., once per year) management protocol, and curtailment of incompatible human activities can keep upland habitat in a high-quality state for the eastern ribbonsnake. Activities that temporarily or permanently destroy habitat or affect the connectedness and the structural complexity of upland habitat can have detrimental effects on the eastern ribbonsnake. The long-term upland habitat management goal is to maintain open-canopy (sun exposed) habitat, thereby preserving dense ground-layer vegetation (grasses and non-woody broad leaf plants). Any upland area within 5-10 m of water should be managed to provide a balance of dense ground layer vegetation and shrubs and woody vegetation. Shrubs and woody vegetation near water are extremely important for thermoregulation and cover for the eastern ribbonsnake. Dense ground layer vegetation is ideal for amphibians and small mammals, which provide some of the necessary overwintering sites for the eastern ribbonsnake. This goal should be accomplished by mowing, cutting, burning, and/or herbiciding to prevent the encroachment of woody vegetation (brush and trees) before thinning of the ground layer vegetation occurs due to shading (see below for proper protocol). Grazing is a technique that should not be used.

Livestock can trample native plants, disturb and compact soil increasing erosion, and potentially create excessive concentrations of nutrients (Kingsbury and Gibson 2012). Ribbonsnakes and their amphibian prey are extremely sensitive to disturbance and grazing may negatively impact populations.

- Mowing/Haying:
    - Conduct monthly mowing in small patches using a rotational pattern with no more than 33% of the available grassland habitat on the site affected in any one year
    - Mower blades must be set a minimum of 8 in off the ground
    - Mow when weather conditions are most likely to avoid snake activity
        - For the eastern ribbonsnake mowing can be conducted at a distance of greater than 10 m from any water source during the months of June-August
- Herbiciding
    - Herbiciding should occur during the snake's dormant period (November 16-March 14)
    - Where active season herbiciding is necessary to control herbaceous vegetation, spot treat, preferably with a low persistence/short half-life herbicide, using wick, sponge or hand-held spray applications, not broadcast spraying.
    - Basal-bark or cut-stump-treatment methods should be used when treating woody vegetation

Seasonal (Ephemeral) Wetlands: Management should focus on creating and maintaining extensive shallow shorelines and gently sloping banks (Kingsbury and Gibson 2012). For projects that are creating ephemeral wetlands, ensure that a low dam with slopes that are < 5% is shaped over the core, and that the core trench is filled with clay before topsoil is roughly spread over the area (Kingsbury and Gibson 2012). Draining and ditching in and around these areas should be avoided. It is important to establish core terrestrial buffer zones of native vegetation at least 10 m from water, and maintain these buffer zones to provide shoreline structure for breeding, foraging, and refuge. Buffer zones should include management around native shrubs that provide cover and thermoregulating microenvironments for the eastern ribbonsnake. It is vital to ensure connectivity between various ephemeral wetlands or between ephemeral wetlands and permanent wetlands and waterways so amphibians and ribbonsnakes may move once these areas dry up.

Permanent Wetlands: Lakes, ponds, reservoirs, and marshes: Maintaining wetland habitat for the eastern ribbonsnake can be accomplished with a light but consistent (e.g., once per year) management protocol, with the goal of maintaining an open-canopy wetland. Water levels in permanent wetlands should not be lowered from October 1-April 30 when ribbonsnakes and amphibians may be overwintering. It is important to maintain natural plant succession patterns in adjacent terrestrial habitats and wetland habitat management may involve thinning and/or removing woody vegetation. Sustaining viable crayfish populations will likely help increase carrying capacity of populations by providing more refugia and overwintering locations.

Wet Meadows, Bogs and Fens: Active management of invasive species (e.g., purple loosestrife [*Lythrum salicaria*], buckthorn [*Rhamnus cathartica*], reed canary grass [*Phalaris arundinacea*]) is critical in these habitats. Reed canary grass is especially problematic because this species has a rapid and dense growth that quickly overcrowds and shades all native plants (Kingsbury and Gibson 2012), and eventually native flora is completely restricted and the result is a loss of vegetative structure. Stands of reed canary grass lack elevated basking sites and likely make movement by eastern ribbonsnakes difficult. Reed canary grass also likely prevents eastern ribbonsnakes from being able to burrow in the muck due to the impenetrable mat that the roots form. Woody plant encroachment and succession should be managed on a yearly basis. Information on how to manage for invasive species can be found in the "Linked Websites" section below.

Floodplain management: Active management to increase and cultivate floodplain areas will create more ideal habitat for amphibians and the eastern ribbonsnake while potentially creating corridors of safe travel.

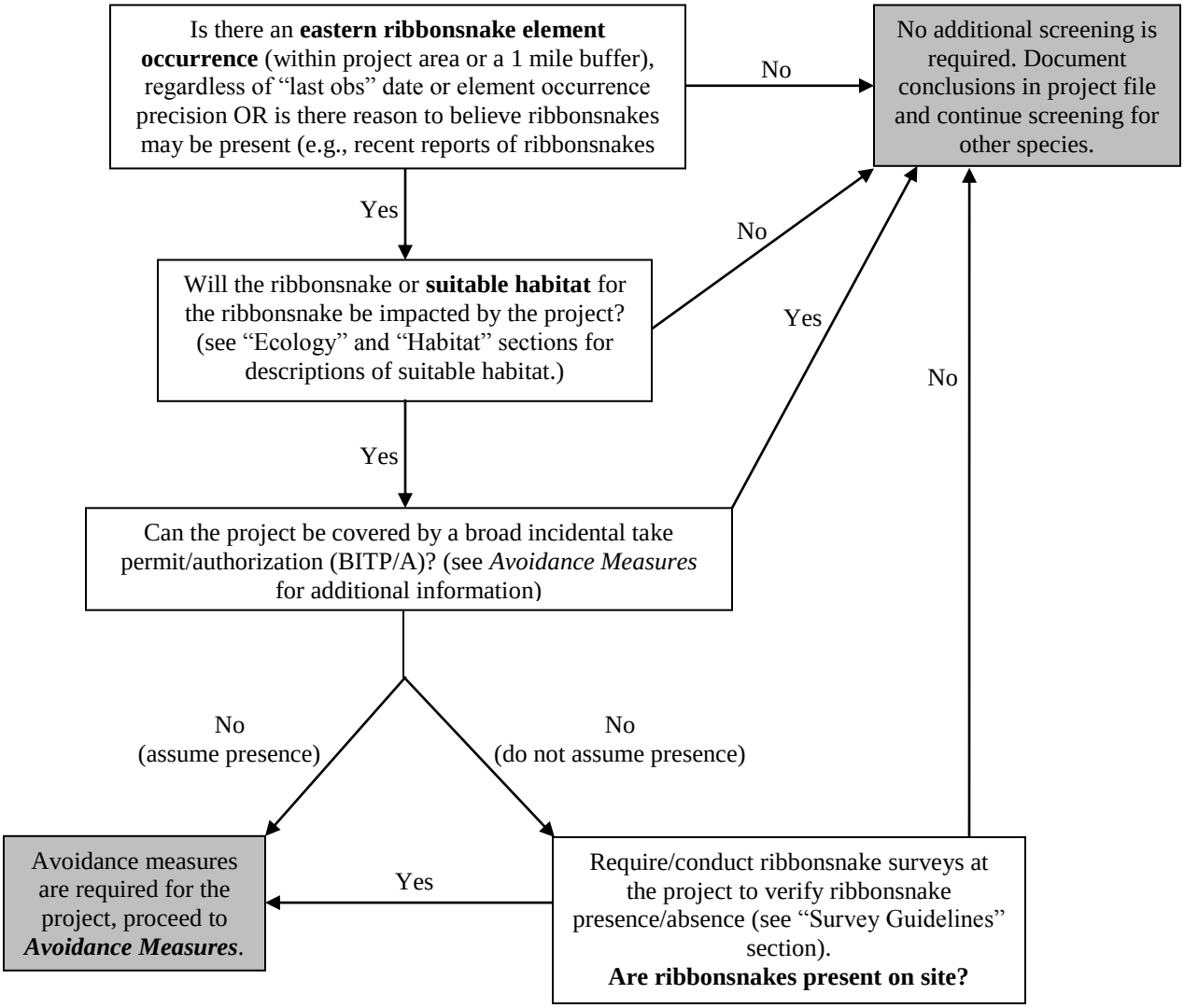
General Management: Plastic netting without independent movement of strands can easily entrap snakes and other wildlife moving through the area, and cause dehydration, desiccation, and eventually mortality (Kapfer and Paloski 2011). If erosion matting (also known as an erosion control blanket, erosion mat or erosion mesh netting) is used, use the following matting (or something similar): North American Green S75BN, S150BN, SC150BN or C125BN. Netting that contains biodegradable thread with the "leno" or "gauze" weave (contains strands that are able to move independently) has the least impact on wildlife.

Creating and managing corridors, underpasses, and culverts between suitable habitats will likely help to offset effects of habitat fragmentation and provide connectivity between populations.

Screening Procedures

The following procedures must be followed by DNR staff reviewing proposed projects for potential impacts to the species.

Follow the "Conducting Endangered Resources Reviews: A Step-by-Step Guide for Wisconsin DNR Staff" document (summarized below) to determine if eastern ribbonsnakes will be impacted by a project (WDNR 2012):



Avoidance Measures

The following measures are specific actions typically required by DNR to avoid take (mortality) of state endangered or threatened species per Wisconsin's Endangered Species Law (s. 29.604, Wis. Stats.). These guidelines are typically not mandatory for non-listed species (e.g., special concern species) unless required by a permit, authorization or approval.

According to Wisconsin's Endangered Species Law (s. 29.604, Wis. Stats.), it is illegal to take, transport, possess, process, or sell any wild animal on the Wisconsin Endangered and Threatened Species List (ch. NR 27, Wis. Admin. Code). Take of an animal is defined as shooting, shooting at, pursuing, hunting, catching or killing.

If *Screening Procedures* above indicate that avoidance measures are required for a project, follow the measures below. If you have not yet read through *Screening Procedures*, please review them first to determine if avoidance measures are necessary for the project.

1. The simplest and preferred method to avoid take of eastern ribbonsnake is to avoid directly impacting individuals, known

eastern ribbonsnake locations, or areas of suitable habitat (described above in the "Ecology" and "Habitat" sections and in *Screening Procedures*).

2. If suitable habitat cannot be avoided, follow these time-of-year restrictions to avoid take:

- Conduct work a minimum of 10 m (33 ft) from the shoreline of a water source during the snakes' summer period (June 1-August 31)
- Conduct work a minimum of 175 m (574 ft) from the shoreline of a water source during the snakes' migrating and overwintering period (September 1-May 31)
- Install snake exclusion fencing according to the Amphibian and Reptile Exclusion Fencing Protocols at least 10 m from the shoreline of a water source during the snakes' summer season (typically June 1-August 31). Work can then be conducted within the fenced area at any time of year as long as the fencing is maintained.

3. If impacts cannot be avoided but the No/Low Impact Broad Incidental Take Permit/Authorization (BITP/A; http://dnr.wi.gov/topic/ERReview/ITNoLowImpact.html) can be followed, the project is covered for any unintentional take that may occur.

4. If eastern ribbonsnake impacts cannot be avoided or covered by the No/Low Impact BITP/A, please contact the Natural Heritage Conservation Incidental Take Coordinator (see *Contact Information*) to discuss possible project-specific avoidance measures. If take cannot be avoided, an Incidental Take Permit or Authorization is necessary.

Additional Information

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Linked Websites

- Controlling Invasive Species: <http://dnr.wi.gov, key word "invasive control">
- Incidental Take Permit and Authorization: <http://dnr.wi.gov, key word "incidental take overview">
- Natural Communities of Wisconsin: <http://dnr.wi.gov, key word "natural communities">
- Rare Animal Field Report Form: <http://dnr.wi.gov, key word "rare animal field report form">
- Wisconsin Endangered and Threatened Species: <http://dnr.wi.gov, key word "endangered resources">
- Wisconsin Endangered and Threatened Species Permit: <http://dnr.wi.gov, key word "endangered species permit">
- Wisconsin Initiative on Climate Change Impacts: <http://www.wicci.wisc.edu/>
- Wisconsin Natural Heritage Working List: <http://dnr.wi.gov, key word "Natural Heritage Working List">
- Wisconsin's Wildlife Action Plan: <http://dnr.wi.gov, key word "Wildlife Action Plan">

Funding

- USFWS State Wildlife Grants Program: <http://wsfrprograms.fws.gov/subpages/grantprograms/swg/swg.htm>
- Sadie Nolan Amphibian and Reptile Education and Conservation Memorial Fund
- Wisconsin Natural Heritage Conservation Fund

Contact Information (Wisconsin DNR Species Expert for Eastern Ribbonsnake)

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Suggested Citation

- Wisconsin Department of Natural Resources. 2013. Wisconsin Eastern Ribbonsnake Species Guidance. Bureau of Natural Heritage Conservation, Wisconsin Department of Natural Resources, Madison, Wisconsin. PUB-ER-710.

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