Western Ribbonsnake (*Thamnophis proximus*) Species Guidance

Formerly known as the Orange-striped ribbonsnake
Family: Colubridae

State Status: Endangered (1979)

State Rank: S1

Federal Status: None

Global Rank: G5

Wildlife Action Plan Mean Risk Score: 3.4

Wildlife Action Plan Area Importance Score: 1

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

Photo by A.B. Sheldon

Species Information

General Description: The western ribbonsnake is a long slender snake generally measuring 51-76 cm (20-30 in) in total body length (TBL), with a maximum of 107 cm (42 in), and a tail comprising roughly 30% of TBL (Minton 1972, Harding 1997, Ernst and Ernst 2003). Ventral scale counts generally fall between 141-181with an undivided anal plate (Harding 1997, Ernst and Ernst 2003). The body of the western ribbon snake is black or dark brown with one cream to bright yellow lateral stripe on each side of the snake and a dull orange ventral stripe (Minton 1972, Harding 1997, Ernst and Ernst 2003). Lateral stripes are present on scale rows three and four (Rossman 1996, Ernst and Ernst 2003) and a dark ventrolateral stripe (a brown stripe extending from scale rows one and two onto the ventral scales) is absent; however, in populations adjacent or sympatric to eastern ribbonsnakes (*Thamnophis sauritus*) a thin ventrolateral stripe may be present (Rossman 1962, Ernst and Ernst 2003). Western ribbonsnakes generally possess eight supralabial scales (scales that border the mouth opening along the upper jaw) on each side but may range from seven to nine, and nine to 11 infralabial scales (scales that border the mouth opening along the lower jaw); both sets of labial scales and ventral scales lack marking (Ernst and Ernst 2003). A thin white stripe lines the anterior portion of the eye, and there are generally two large, brightly colored, fused parietal spots (white to yellowish spots on the parietal scales on the back of the head) on the top of the head (Rossman 1962). The head is short, and a distinct narrowing or "neck" is present between the head and the body (Ernst and Ernst 2003). Individuals may vary in these characteristics, and some may differ slightly from this general description.

Similar Species: The eastern ribbonsnake also displays a slender body, tail comprising approximately 30% TBL, a white stripe bordering the anterior portion of the eye, and it lacks markings on the ventral and labial scales. However, the eastern ribbonsnake generally has a very broad and defined dark ventrolateral stripe and typically only has seven supralabial scales on each side. The eastern ribbonsnake often lacks parietal spots on the top of the head, and the spots, if present, are typically faint and not fused. Other gartersnake species in Wisconsin (i.e., common gartersnake [*Thamnophis sirtalis*], Butler's gartersnake [*Thamnophis butleri*], and plains gartersnake [*Thamnophis radix*]) have much shorter tails and typically have dark markings on their labial and ventral scales. The plains gartersnake is the only gartersnake species in Wisconsin with a lateral stripe present on scale rows 3 and 4.

Associated Species: Associated species with the western ribbonsnake include predators such as large wading birds (e.g., herons), cranes, shrikes, hawks, raccoons (*Procyon lotor*), and foxes (Ernst and Ernst 2003). Other species strongly associated with the western ribbonsnake are prey including, frogs (e.g., boreal chorus frog [*Pseudacris maculata*], Cope's gray treefrog [*Hyla chrysoscelis*], gray treefrog [*Hyla versicolor*], northern leopard frog [*Lithobates pipiens*], American toad [*Anaxyrus americanus*], and Blanchard's cricket frog [*Acris blanchardi*]), salamanders, and crayfish. Clark (1974) recorded a western ribbonsnake feeding on mosquito fish (*Gambusia affinis*) in Texas.

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State Distribution and Abundance: The western ribbonsnake occurs in relict populations throughout the state. Populations are spotty from southeastern Wisconsin, northeast Wisconsin, central Wisconsin, and southwest Wisconsin. Distribution information for this species may not reflect its full extent in

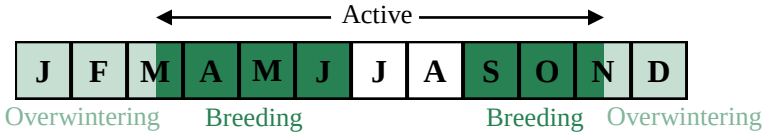
Wisconsin because many areas of the state have not been thoroughly surveyed.

Global Distribution and Abundance: The full extent of the snake's range borders the east bank of the Mississippi river through northern Illinois and makes it way south to the Gulf of Mexico and west to the western parts of Texas, Oklahoma, and Kansas, and the eastern part of Nebraska. Relict populations occur in Indiana, Wisconsin, and Illinois.

Diet: The western ribbonsnake's diet consists primarily of amphibians. Fouquette (1954) found that amphibians comprised 82% of the ribbonsnake's diet; Clark (1974) reported a diet of 92% amphibians and a small percentage of lizards and fish. Clark (1974) also documented a strong preference for tadpoles and metamorphosed frogs and toads. Prey species observed in studies that also inhabit Wisconsin include: northern leopard frog, boreal chorus frog, American toad, eastern newt, spring peeper, Cope's gray treefrog, gray treefrog, Blanchard's cricket frog, eastern red-backed salamander (*Plethodon cinereus*), mosquito fish, rainbow trout (*Oncorhynchus mykiss*), longear sunfish (*Lepomis megalotis*), salamanders, and crayfish (Fouquette 1954, Myers 1959, Rossman 1963, Clark 1974, Hampton 2008). There is also an account of western ribbonsnakes displaying occasional cannibalistic traits (Smith 1961).

Reproductive Cycle: Female western ribbonsnakes generally reach maturity at 12-15 months and measure approximately 51.5 cm (20.3 in) in snout-to-vent length, whereas males reach maturity in less than a year and measure roughly 40 cm (15.7 in). Mating generally occurs when snakes are two years old (Tinkle 1957, Clark 1974). Clark (1974) documented females containing sperm on April 26, May 9, and June 17 and 23, and this information provides support for a spring mating season. However, Ford (1981) demonstrated that pheromone trailing (strategy for long-distance locations of same species) remains strong throughout the year, suggesting a summer and fall breeding season, as well, with sperm held in females' reproductive tracts over winter. Studies have shown that reproduction is likely annual (Tinkle 1957, Clark 1974, Seigel and Ford 1987), and gravid females have been found as early as April and present throughout September with recorded parturition dates ranging from late-June to mid-September. Most births occur during July and August (Tinkle 1957, Carpenter 1958, Neill and Allen 1959, Rossman 1963, Fitch 1970, Clark 1974, Powell 1982). Brood sizes range from four to 27 (Harding 1997), average brood size has been reported as 12 (Ruthven 1908), 13 (Tinkle 1957), nine to 12 (Carpenter 1958), 8.4 (Clark 1974), and 8.4-12.9 (Rossman 1996). Neonates reach 13.3-29.8 cm TBL and have relatively long tails with disproportionately rapid tail growth (Bowers 1967, Seigel et al. 1986, Thornton and Smith 1996).

Ecology: The western ribbonsnake is rare in this region, and information about its natural history in Wisconsin is scarce. Understanding of western ribbonsnake ecology, therefore, comes largely from research conducted elsewhere. The western ribbonsnake is extremely dependent on precipitation. Clark (1974) observed a Texas population decline during very dry winters and increase during wet winters. Jacobson and Whitford (1970) found that the western ribbonsnake shifted thermal tolerance when acclimated at different air temperatures and suggest that this may represent an important adaptation to changing seasons. High body temperatures in low-temperature-acclimated snakes showed higher oxygen consumption and higher heart rates than high body temperatures in high-temperature-acclimated snakes indicating stress in the former (Jacobson and Whitford 1970). This suggests that temperature control is an extremely important aspect of the ribbonsnake's survival. Western ribbonsnakes bask on mats of vegetation and use open areas before April, but they seek out more shaded areas as daily temperature begins to rise in successive months (Tinkle 1957). Throughout their range, western ribbonsnakes are typically active from March or April to October or early November (Rossman 1996, Ernst and Ernst 2003). Seigel (pers. obs.) noted an activity period from April 1 to November 12 in northern Missouri.



Western ribbonsnakes are primarily diurnal (Rossman 1963), but they forage in ponds at night under ideal conditions (Wendelken 1978, Ernst and Barbour 1989) and are very active during light summer rains (Ernst and Ernst 2003). Population densities for western ribbonsnakes range from 6.4-24.4 snakes/acre (Clark 1974). Ideal overwintering sites may include springs, mammal burrows, anthills, rotten logs and stumps, spaces behind bark on trees, and temporary pond drain pipes (Ernst and Ernst 2003). Tinkle (1957) found western ribbonsnakes overwintering above the water table, and Ernst and Barbour (1989) found snakes overwintering in rocky outcrops with copperheads and rattlesnakes in Illinois.

Natural Community Associations (WDNR 2005, WDNR 2009):
Significant: bedrock glade, shrub carr, southern sedge meadow
Moderate: dry-mesic prairie, emergent aquatic, mesic prairie, oak barrens, wet-mesic prairie
Minimal: none

Habitat: Western ribbonsnakes are strongly associated with brushy habitat near aquatic environments (e.g., swamps, marshes, ponds, lakes, rivers, creeks, desert springs, mixed wet woodlands, sphagnum bogs, sloughs, running brooks, swamps) and bordering vegetation (e.g., grasses, cattails, shrubs; Rossman 1963, Gartside et al. 1977, Ford et al. 1991, Ernst and Ernst 2003). Other ideal

habitat includes sandy, slightly drier open areas within 10 m (33 ft) of water (Minton 1972). Travel routes between areas may include deep drainage ditches (Gartside et al. 1977). These snakes have been documented in the spring seeking out open elevated areas to bask (Tinkle 1957, Rossman 1963). Tinkle (1957) observed western ribbonsnakes seeking cover on ridges in blackberries (*Rubus spp*.), willows (*Salix spp*.), and ditches within cattails (*Typha spp*.), and rarely observed western ribbonsnakes retreating into water. However, Ford (pers. obs.) always observed ribbonsnakes near brush adjacent to water (e.g., ponds, small pools) and often diving into water at disturbance.

Wisconsin plant species associated with ideal western ribbonsnake habitat include: red cedar (*Juniperus virginiana*), northern white cedar (*Thuja occidentalis*), American elm (*Ulmus americana*), and eastern cottonwood (*Populus deltoides*); most species described within Clark's (1974) study area were associated with a very weedy, brushy habitat.

Threats: Western ribbonsnakes are extremely sensitive to human modification and habitat disturbance (e.g., cultivation, draining, filling of wetlands; Minton 1972, Ernst and Barbour 1989, Ernst and Ernst 2003). Roads pose a threat to ribbonsnakes due to resulting fragmentation of habitat and risk of crossing (Fitch 1949). Road contaminants (e.g., oil residues) or road substrate type may potentially alter pheromone scent trailing and thereby threaten successful breeding (Shine et al. 2004). If snakes use drainage ditches or other water sources near roads, construction and erosion control structures (i.e., erosion mats) may also pose a threat to snakes (Kapfer and Paloski 2011).

Climate Change Impacts: Projected changes in climate may lead to warm dry weather which may reduce soil moisture and negatively impact bogs 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 western ribbonsnake habitat, and a projection of less snowfall in winter could lead to large winter kills of overwintering frogs (WICCI 2011). Amphibians make up a large proportion of the western ribbonsnake's diet, and a shift in climate that depresses amphibian populations would test this species' adaptive capacity. Clark (1974) also noted that dry winters had a negative effect on ribbonsnake populations, and that total winter rainfall from November through February was correlated with population size. Climate projections also include extreme flooding which can encourage the growth of invasive species such as reed canary grass (WICCI 2011); this could create environments hostile to amphibians and negatively impact the ribbonsnake's food supply.

Survey Guidelines: Due to the lack of studies conducted for the western ribbonsnake, it is very important to note that no survey method is considered 100% effective for determining presence/absence. Persons handling western 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*).

For non-regulatory, informational purposes, hand captures, wire-mesh funnel traps, jar traps, cover boards and hardware cloth drift fences placed around concrete foundations have been found to be effective for capturing western ribbonsnakes (Clark 1974, Hampton 2008). When using cover boards, place five to 10 boards in suitable habitat (see "Habitat") March through September. Check the boards several times per week during appropriate weather conditions. Drift fencing should be used in the spring and fall when the snakes are moving to and from winter hibernacula. Erect fencing in appropriate habitat. Drift fencing should be checked every day that traps are opened, and the traps should be closed overnight or during significant rainfall to prevent animals from dying due to temperature extremes or drowning.

For non-regulatory, informational purposes, visual encounter surveys (VES) may also be used. Surveys should be conducted on partly sunny or sunny days during primary snake activity: between 10am and 6pm from May through October (Lind 2005). Lind (2005) conducted surveys using one to three individuals to methodically search stream channels and banks. If two surveyors are present, both should begin down-stream and walk up-stream; if only one surveyor is present, the individual should walk up-stream in the morning and downstream in the early evening and covering the entire survey area (Lind 2005). Other survey techniques that have been found to have some success in surveying for this species include transect/quadrant surveys (Carpenter 1952, Mullin et al. 2009), road count surveys (Fitch 1987), and funnel traps; baiting traps can increase capture rates (Rodda and Fritts 1992, Keck 1994, Rodda et al. 1999, Winne 2005, Wellson et al. 2005).

Summarize results, including survey dates, times, weather conditions, number of detections, detection locations, and behavioral data and submit via the WDNR online report: <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 western ribbonsnake. The habitat management goal for this species is long-term preservation of open-canopy uplands connected, preferably broadly, to open-canopy wetlands.

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 western ribbonsnake. Activities that temporarily or permanently destroy habitat, or that affect the connectedness and the structural complexity of upland habitat, can have detrimental effects on the western ribbonsnake. The long-term upland habitat management goal is to maintain open-canopy (sun exposed) habitat that preserves dense ground-layer vegetation (grasses and non-woody broad leaf plants). Any upland area near water should be managed to provide a balance of dense ground layer vegetation, shrubs, and a small amount of woody vegetation which provide important habitat structure for thermoregulation and cover for the western ribbonsnake. Dense ground layer vegetation is ideal for amphibians and small mammals, which create burrow that provide some of the necessary overwintering sites for the western ribbonsnake. This management 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 western ribbonsnake mowing should be conducted when the snake is inactive (November 16 – March 14).
- 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

Permanent Wetlands: Lakes, ponds, reservoirs, and marshes: Maintaining wetland habitat for the western 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 during the winter (October 1-April 30) when amphibians are 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.

Wet Meadows, Bogs and Fens: Active management of invasive species (e.g., purple loosestrife [*Lythrum salicaria*], buckthorn [*Rhamnus Spp*.], 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 impede movement by western ribbonsnakes. 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.

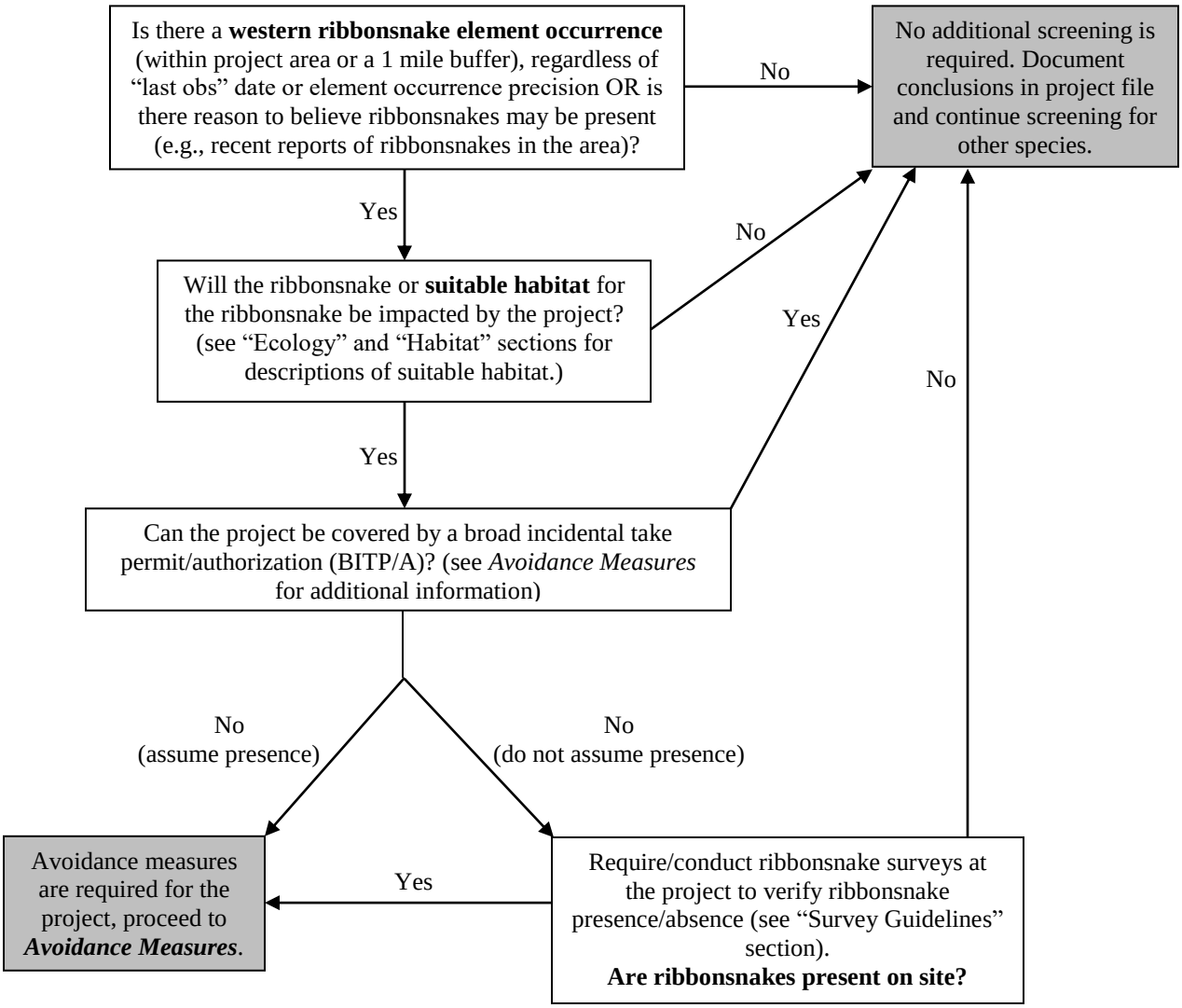
General Management: Plastic netting without independent movement of strands can easily entrap snakes and other wildlife moving through the area and cause dehydration, desiccation, and eventually mortality (Kapfer and Paloski 2011). If erosion matting (also known as an erosion control blanket, erosion 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 western 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 western ribbonsnake is to avoid directly impacting individuals, known western ribbonsnake locations, or areas of suitable habitat (described above in the "Ecology" and "Habitat" sections and in *Screening Procedures*).

2. 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.

3. If western 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.

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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 western ribbonsnakes)

- Refer to the Reptiles contact on the Rare Species and Natural Community Expert List

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