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Species Conservation Guidelines
South Florida

Eastern Indigo Snake

The Species Conservation Guidelines (Guidelines) for the eastern indigo snake (*Drymarchon corais couperi*) provide a tool to determine if a project, *i.e.*, a Federal permit, a Federal construction project, or other such action, may adversely affect eastern indigo snakes. Here we describe what actions might have a detrimental impact on the eastern indigo snake and how these effects can be avoided or minimized.

Life History

The ecology of the eastern indigo snake has been recently reviewed in Hallam et al. (1998) and Service (1999). The eastern indigo snake was listed as a threatened species in 1978 as a result of dramatic population declines caused by overcollecting for the pet trade, as well as mortalities caused by rattlesnake collectors gassing gopher tortoise burrows to collect snakes (Speake and Mount 1973). The eastern indigo snake is a large, slow moving, non-aggressive species that poses no threat to humans. Since its listing, habitat loss and fragmentation by residential and commercial expansion have become much more significant threats to the eastern indigo snake (Service 1999).

Habitat

Eastern indigo snakes make use of a large variety of habitat. In south-central Florida, Layne and Steiner (1996) determined adult male home ranges average about 74 ha (183 acres), and can be as large as 199.2 ha (492.2 acres), whereas adult female home ranges average about 19 ha (47 acres) and can be as large as 48.6 ha (120.1 acres). Because of its relatively large home range, this snake is especially vulnerable to habitat loss, degradation, and fragmentation (Lawler 1977; Moler 1992).

Over most of its range, the eastern indigo snake frequents several habitat types, including pine flatwoods, scrubby flatwoods, high pine, dry prairie, tropical hardwood hammocks, edges of freshwater marshes, agricultural fields, coastal dunes, and human-altered habitats (Service 1999). Eastern indigo snakes appear to need a mosaic of habitats to complete their life cycle. Wherever the eastern indigo snake occurs in xeric habitats, it is closely associated with the gopher tortoise (*Gopherus polyphemus*), the burrows of which provide shelter from winter cold and desiccation (Bogert and Cowles 1947; Speake et al. 1978; Layne and Steiner 1996). Interspersion of tortoise-inhabited uplands and wetlands improves habitat quality for this species (Landers and Speake 1980; Auffenberg and Franz 1982).

Even though thermal stress may not be a limiting factor throughout the year in south Florida, eastern indigo snakes still seek and use underground refugia in the region. On the sandy central

ridge of south Florida, eastern indigos use gopher tortoise burrows more (62 percent) than other underground refugia (Layne and Steiner 1996). Other underground refugia used by this species include armadillo (*Dasypus novemcinctus*) burrows near citrus groves, cotton rats (*Sigmodon hispidus*) burrows, and land crabs (*Cardisoma guanhumi*) burrows in coastal areas (Wilson and Porras 1983). Natural ground holes, hollows at the base of trees or shrubs, ground litter, trash piles, and crevices of rock-lined ditch walls are also used (Layne and Steiner 1996). These refugia are used most frequently where tortoise burrows are not available, principally in low-lying areas off the central and coastal ridges. In extreme south Florida (the Everglades and Florida Keys), eastern indigo snakes are found in tropical hardwood hammocks, pine rocklands, freshwater marshes, abandoned agricultural land, coastal prairie, mangrove swamps, and human-altered habitats (Steiner et al. 1983). It is suspected that they prefer hammocks and pine forests, because most observations occur in these habitats disproportionately to their area (Steiner et al. 1983). Hammocks may be important breeding areas as juveniles are typically found there. The eastern indigo snake is a snake-eater so the presence of other snake species may be a good indicator of habitat quality.

Based on studies in the south-central Florida region, Layne and Steiner (1996) believe that the eastern indigo snake does not require undisturbed habitat and can persist in semi-developed rural areas and housing subdivisions as long as food resources and adequate cover are available. Eastern indigo snakes inhabiting populated areas may become relatively tolerant of human environs, regularly moving about in the open on lawns, patios, or porches, largely ignoring humans and pets (Layne and Steiner 1996). These developed areas can provide suitable refugia and foraging opportunities, but snakes are more vulnerable because to the tendency of people to kill snakes and the snakes' tendency to move about exposing them to vehicular traffic. Snakes suffer the greatest vehicular mortality from June to November in central Florida (Enge and Wood 2002).

Distribution

Eastern indigo snakes still occur throughout Florida, though they are not commonly seen (Moler 1992). Given their preference for upland habitats, eastern indigo snakes are not commonly found in the wetland complexes of the Everglades region but are reported from drier areas (Duellman and Schwartz 1958; Steiner et al. 1983). Eastern indigo snakes also occur in the Florida Keys. They have been collected from North Key Largo, Big Pine, and Middle Torch Keys and are reliably reported from Big Torch, Little Torch, Summerland, Cudjoe, Sugarloaf, and Boca Chica Keys (Lazell 1989; Service 1999).

Determination

Review the SLOPES flowchart in Figure 1 to identify how a given project may affect the eastern indigo snake and what options are available for minimizing impacts to this species. Since eastern indigo snakes have been found in many habitats in south Florida, most terrestrial projects may affect the species. Suitable habitat in south Florida may include all native habitats except

permanent wetlands. When gopher tortoise burrows occur in the project area, a close watch should be kept for eastern indigo snakes. The gopher tortoise is protected by State law; as such state guidelines should be followed when dealing with burrows (FWC 2001). If an eastern indigo snake is encountered during tortoise burrow surveys it should be allowed to leave without harassing it. If burrow excavation is planned and an eastern indigo snake is observed in the burrow, then excavation must be conducted with particular caution to prevent potential injury to the snake. Excavation should not occur without proper permits from the State. Once excavated, cease construction activities long enough to allow the snake to leave the area. Report all burrow surveys (including negative ones) and snake sightings in a biological report (see below).

Conservation Measures

It appears that harm to the indigo snake occurs primarily through construction accidents, vehicular strikes, and habitat loss/degradation. These adverse effects can be minimized by maintaining a careful watch during construction and when traveling on site to avoid killing snakes. In addition, protecting gopher tortoise burrows and leaving native vegetation as refugia on site for snakes displaced by construction activity can benefit this species.

The eastern indigo snake is not likely to be adversely affected if the following measures are implemented for the project.

1) Gopher tortoise burrows on site are protected via conservation easements. If such habitat must be disturbed, limit disturbance to a minimum and improve remaining habitat through exotic vegetation removal. Native vegetation should be maintained on site as refuges for the snake.

2) Clearing and grading activities should be performed outside high activity months (June to November). Winter months (January to March) provide the best opportunity to initiate and complete construction activities that will not impact this species.

3) Post informational signs containing the following information throughout the construction site and along any proposed access road:

    a. a description and picture of the eastern indigo snake, its habits, and protection under Federal Law;
    b. instructions not to injure, harass, or kill this species;
    c. directions to cease clearing activities and allow the eastern indigo snake sufficient time to move away from the site on its own before resuming clearing; and,
    d. telephone numbers of pertinent agencies to be contacted if a dead eastern indigo snake is encountered (see below).

    Informational posters should be submitted for review as part of the initiation package (see below). Other useful educational materials may consist of a combination of posters, videos, pamphlets, and lectures (*e.g.*, an observer trained to identify eastern indigo snakes

could instruct construction personnel before any clearing activities occur).

4) Monitor eastern indigo snake activity on site. Report any eastern indigo snake observations that occur during project activities (see monitoring report below). Handling and moving the snakes is not allowed without a special permit. If large snake skins are found they may belong to an eastern indigo snake. These can be collected and sent to the Service for positive identification. Information on the date and location collected are needed.

If the project involves substantial land clearing, a determination of likely to adversely affect may be warranted. In this situation, the Service recommends early coordination to identify options available to reduce adverse impacts to the indigo snake.

Report Guidelines

See the *Guide to a Complete Initiation Package* (Service 2004) for information on what is needed for a biological report. This document is the basis for a determination and needs to include sufficient information to support the determination.

Monitoring Report

A monitoring report should contain the following information: location, dates, and times for any sightings of eastern indigo snakes. Also include the results any of tortoise burrow searches. If a snake is encountered during a tortoise burrow search then a description of the outcome for the snake is needed. Was the snake left in an intact burrow? Was the burrow excavated? If so, did the snake leave and where did it go? A site map with sighting locations marked would be helpful. If no snakes are encountered, a report should be submitted indicating that fact. The report should be sent to the South Florida Ecological Services Office (attention: Eastern Indigo Snake Lead Biologist) within 60 days of the conclusion of the project.

Dead, injured, or sick animals

If a dead, injured, or sick eastern indigo snake is found on site, notification should be made to the nearest Fish and Wildlife Service Law Enforcement Office. Secondary notification should be made to the Florida Fish and Wildlife Conservation Commission; South Region; 3900 Drane Field Road; Lakeland, FL 33811; Wildlife Alert Number 1-800-404-3922.

A dead specimen should be thoroughly soaked in water, and then frozen. In conjunction with the care of sick or injured eastern indigo snakes or preservation of biological material from a dead animal, the finder also has the responsibility to carry out instructions provided by the Fish and Wildlife Service Law Enforcement officer to ensure that evidence intrinsic to the specimen is not unnecessarily disturbed.

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None available.