



EFFECTIVENESS OF SURVEYING FOR EASTERN INDIGO SNAKES USING ARTIFICIAL COVERS

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Abstract

A goal of Comprehensive Everglades Restoration Plan (CERP) is to improve water quality and hydrology of the Everglades through the construction of large water treatment projects. During the construction of these projects there is potential to impact federally threatened and endangered species. One of the species that has been impacted by the construction of CERP projects is the threatened eastern indigo snake, *Drymarchon couperi*. The indigo snake is a habitat generalist and is very difficult to find using ocular walking surveys or various trapping methods. Therefore, the U.S. Fish and Wildlife Service (Service) convened an interagency team in 2009 to identify management needs for the federally threatened eastern indigo snake in south Florida. As part of this initiative, the Service, Florida Fish and Wildlife Conservation Commission, Corps and South Florida Water Management District began a study to test field-monitoring techniques for use in determining indigo snake presence. This study was conducted in Martin County, Florida, within the area proposed to be developed as the C-44 Reservoir and Stormwater Treatment Area, a CERP project. The objective of the study was to develop and test survey methods with the potential to document indigo snakes, thereby significantly reducing the cost of locating the species. Artificial cover was placed on the site along a 1.6 km grid on the existing perimeter and interior canals of the 3.2 km by 4.8 km reservoir. A total of 19 stations were established within the footprint of the reservoir. There were 9 different types of artificial cover created: carpet, untreated sheathing plywood, single plywood, 4 stack plywood, single tin, 4 stack tin, 2 stack tin, artificial burrows, and abandoned buildings. The abandoned buildings had the greatest success at attracting indigo snakes. Tin (2 stacks) and plywood (4 stacks) also had some measurable success at attracting indigos. The 4 stacks of plywood had the best success at attracting all other herpetofauna. The stack of 2 tin sheets and a single plywood sheet had the most success at attracting small mammal species. For future cover studies, we recommend an assortment of cover items including plywood (4 stacks), tin (2 stacks), and single plywood. There is no evidence to support the continued use of carpet, untreated sheathing plywood, single tin, or tin (4 stacks) in cover studies.

Introduction

Many snake species are difficult to survey due to their low population densities, long periods of inactivity, and inconspicuous use of habitats (Parker and Plummer 1987). The eastern indigo snake has proven to be a challenging species to study, as there is no reliable method for surveying or monitoring populations. These difficulties, coupled with time constraints, encouraged us to explore new methods of surveying for these snakes.

An inter-agency team consisting of the U.S. Fish and Wildlife Service (USFWS), Army Corp of Engineers (Corps), and Florida Fish and Wildlife Conservation Commission (FWC) was convened in 2009 to address concerns for the impacts of Comprehensive Everglades Restoration Plan (CERP) restoration projects on the eastern indigo snake. The team was tasked with determining what measures can be taken to avoid and minimize these adverse impacts. As part of this initiative, the USFWS and FWC began testing field-monitoring techniques to determine the presence of eastern indigo snakes. The objective of the study was to develop and test survey methods with the potential to document eastern indigo snakes, thereby significantly reducing the cost of locating the snakes.

The C-44 Reservoir and Stormwater Treatment Area (C-44) project is a component of the Indian River Lagoon – South restoration project that is being constructed under CERP. The project includes the construction of a reservoir and two stormwater treatment areas that encompass 4,856 ha. The project footprint was initially located in an orange grove, which has been cleared in preparation for the construction of the reservoir and STAs.



Method

Artificial cover was placed on the site along a 1.6 km grid on the existing perimeter and interior canals of the 3.2 km by 4.8 km reservoir. Nineteen stations were established within the footprint of the reservoir.

There were 9 different types of artificial cover analyzed: carpet, untreated sheathing plywood, single plywood, 4 stack plywood, single tin, 4 stack tin, 2 stack tin, artificial burrows, and abandoned buildings. Not all cover types were at each station.

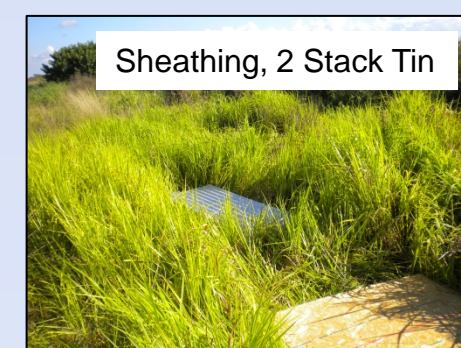
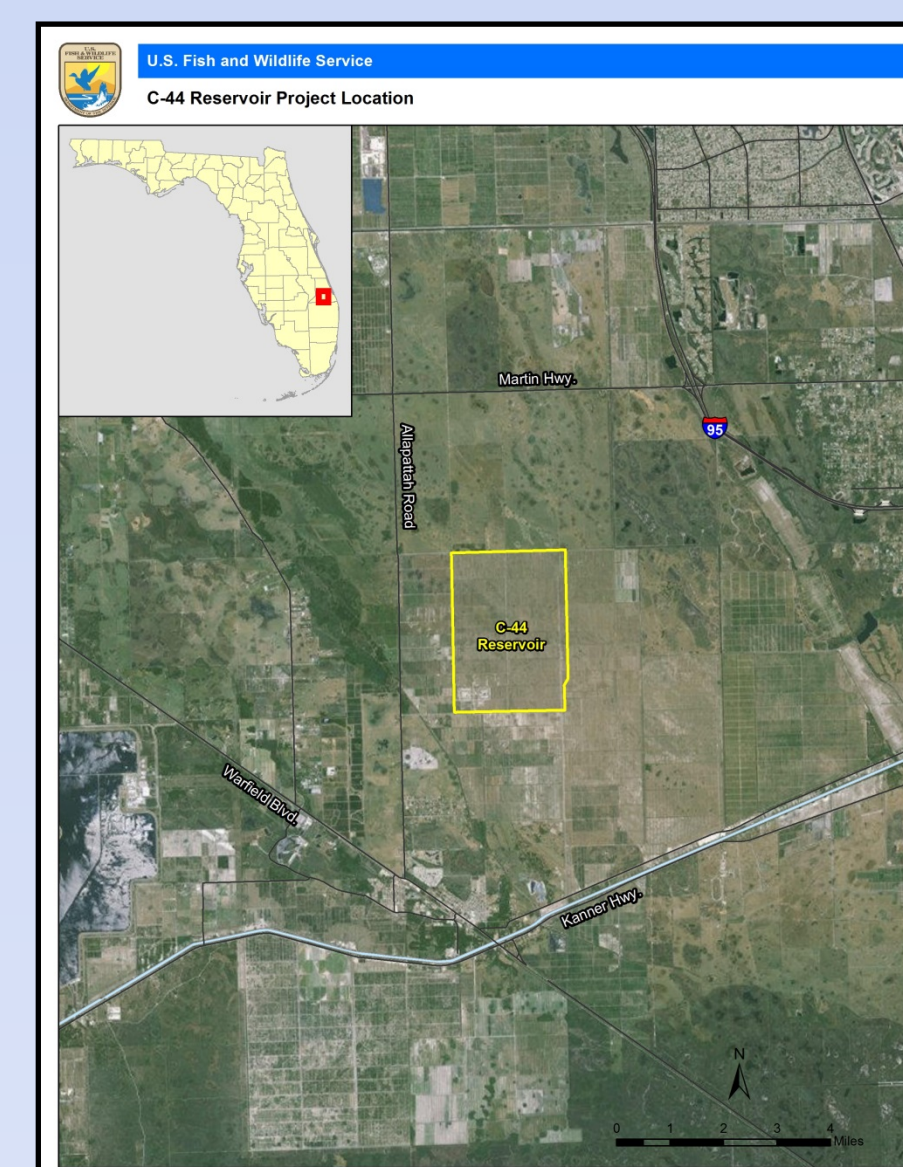
- Single untreated sheathing plywood*.
- Single plywood* sheets and 4 stack plywood*.
- Stacked plywood* were 4 sheets of plywood stacked on top of each other with 5 spacers**.
- Corrugated tin 2.4 m x 0.15 m placed in single arrangements, 2 stack with 5 spacers, and 4 stack with 5 spacers on each layer.
- Pieces of household carpet cut to various sizes were also used as cover.
- Artificial burrows were buried to a depth of 33cm, leaving the top uncovered.
- Three buildings remained on the site and were checked for indigo presence as a part of the cover study
- *Board size: 1.2 m x 2.4 m x 1.9 cm
- **Spacer sizes: 1.9 cm x 3.7 cm and 3.7 cm x 3.7 cm

Table 1. Total number of visits for each cover type at each station.

Station	Cover type				
	Single Plywood	Plywood 4	Burrow	Tin 2	Buildings
1	0	139	102	0	0
2	139	139	102	0	0
3	139	139	0	0	0
4	139	139	0	0	0
5	139	139	102	0	0
6	139	139	139	0	0
7	0	121	0	0	0
8	0	139	0	0	0
9	139	0	0	139	0
10	139	0	0	0	0
11	139	0	0	0	0
12	0	0	102	0	0
13	0	0	100	0	0
14	40	0	40	0	0
15	37	0	0	0	0
16	40	0	40	0	0
17	39	0	38	0	0
18	0	0	67	0	0
Buildings	0	0	0	0	139
Total	1268	1094	832	139	139

Table 2. Total number of indigo snakes observed per cover type.

Plywood 4 stack	Tin 2 stack	Single plywood	Burrow	Buildings
5	1	4	1	18



Acknowledgements

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Summary

- A four-year monitoring effort resulted in:
- Only five of the nine cover types captured at least one indigo snake.
 - Single plywood had the most visits of all covers, while tin 2 and buildings had the least (Table 1).
 - Buildings had a significantly higher probability of capturing an indigo snake than other covers.
 - Buildings had a probability of 0.11 which was about 16 times more likely to capture an indigo snake per visits per station.
 - Tin 2 had a capture probability of 0.007, which was about six times more likely than burrow (0.001) because of much less effort for the same number of captures (1).
 - Plywood 4 and single plywood had similar probabilities of about 0.0045 and 0.003 respectively.
 - Table 2 shows number of indigos attracted to a particular cover type.

Reference

Parker, W.S., and M.V. Plummer. 1987. Population ecology. pp. 253–301 In Snakes: Ecology and Evolutionary Biology. Seigel, R., J. Collins, and S. Novak (Eds.). MacMillan Publishing Company, New York, New York, USA.