The use of inexpensive GPS loggers as a tool in the conservation of the New York State threatened Blanding`s turtle (*Emydoidea blandingii*).

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Introduction

Blanding's turtles are threatened in NY due to loss and fragmentation of habitat and road mortality. There are four distinct populations of Blanding's turtles in the state, the largest along the St. Lawrence River Valley, which occurs in large wetland complexes that are distributed in an agricultural matrix; the second largest in the Hudson River Valley, which occurs in wetlands distributed among developed and residential areas; and two small populations in western NY and the Saratoga area. The most significant threat to this species is mortality by vehicles, specifically to mature females as they leave wetlands to nest in uplands in June. Due to the predominance of agriculture in the St. Lawrence River Valley, successful gravid females are likely to nest in farm fields, which pose an ecological trap to nesting turtles as these sites tend to be cooler during the incubation period as the vegetation grows. Identifying natural nesting areas and patterns of movement are the first steps in implementing strategies to mitigate threats of roadways or agriculture to these turtle populations. Here we detail the methods that we used to modify inexpensive GPS loggers (model I-GOTU GT-120) (Fig. 1) for use on turtles and the results of tracking movements of gravid female Blanding`s turtles equipped with loggers in northern NY.

Fig. 1. GPS data logger (model IGOTU GT-120) used for maintaining locations on Blanding's turtles (a). Casing is removed from the device to reduce size (b), it is wrapped in electrical tape (c) and enclosed in three finger cots, superglued, then placed in Flex Tape®(d) and mounted on a platform for easy replacement (e). The mounting plate is secured with epoxy along the right or left posterior edge of the turtle's shell (f). Device dimensions, 44.5 x 28.5 x 13 mm, 20g (g).

Methods

We deployed GPS devices (model I-GOTU GT-120) on 28 turtles at three sites in the St. Lawrence River Valley. Mounting plates were installed on all captured females anticipating that they would be gravid. Once field checks indicated that a turtle was gravid, a GPS logger was affixed to the turtle's mounting plate with zip ties. We set loggers to collect waypoints every 5 minutes, 24 hours a day. Within 7-10 days of deployment, each turtle was checked for gravidity. If a turtle was still gravid, the logger was replaced with a new device. If gravidity was not noted on recapture, the logger and mount were removed as the turtle was presumed to have nested.

Potential nest locations were identified by reviewing the logger data in ArcGIS. Cluster centroids were generated for each turtle and the average distance from each point in this cluster was used to delineate a radius around the mean nest location of which the nest could potentially fall within.

We released some individuals at created nesting sites adjacent to their native wetlands following confirmation of gravidity to attempt to encourage nesting at these sites and to document individuals' responses to relocation.

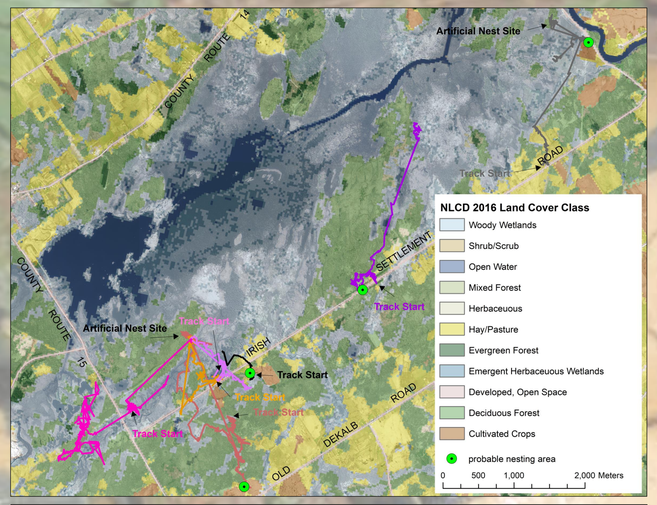

Fig. 2. Site 1 turtle tracks. Seven turtles were tracked at this site and 4 potential nest locations were approximated. Five gravid female turtles were relocated to the created artificial nest site.

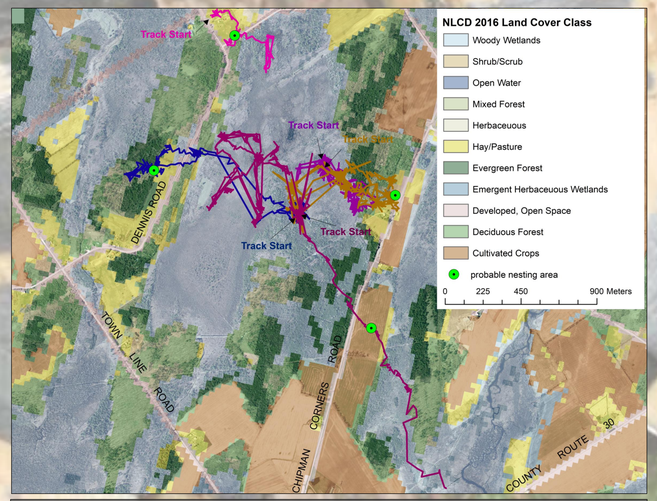

Fig. 3: Site 2, turtle tracks. Five turtles were tracked at this site. The location of 4 nests were approximated.

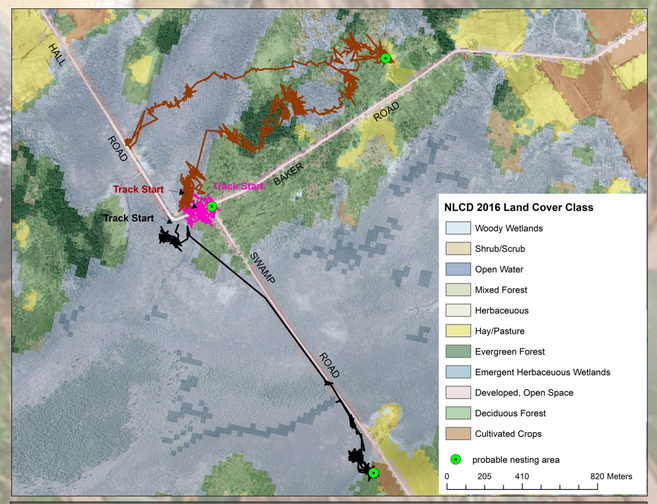

Fig. 4. Site 3, turtle tracks. Three turtles were tracked at this site. The location of 3 nests could be approximated.

Findings

- We collected 264 days of track data at three sites (1 track day = 1 day/ per turtle) (Figs. 2-4).
- Of 28 turtles tracked, 18 were determined to be gravid after multiple field checks.
- Potential nest locations of 12 gravid females were estimated. The other 6 could not be estimated because logged locations did not appear to cluster. Nest locations fell within 2 categories: agriculture fields/pastures and driveway/road edges.
- It appeared that no relocated turtles nested at created artificial nesting sites. In fact, relocated turtles either returned to the wetland in which they were captured or continued in the direction of travel prior to relocation.
- Data was not precise enough to allow for the exact location of nests on the ground.
- Two devices on turtles at different sites showed similar signs of damage indicative of a predator attack. One device was found removed from the turtle along with the radio transmitter.
- Material costs were approximately $4,100, which contrasted with $22,400 in materials if purchased a more expensive data logger designed for wildlife ($800 per unit).
- All devices performed as expected. No devices were lost or damaged by water damage.


Blanding's Turtle Study Area


Male Blanding's turtle ready for release


Newly captured Blanding's turtle

Discussion

The efficacy of using these devices for this study demonstrates the practical application of these devices as a conservation tool that can be applied to other studies. The use of these devices makes large scale and accurate tracking of target individuals possible with reduced funding.

Several peculiar phenomena were also recorded throughout the course of our study, including the possible resorption of a clutch by one individual, which was corroborated by logger data not indicating a cluster of nesting activity. This phenomenon may be more common than previously known as a number of gravid turtles did not demonstrate typical or expected nesting activity and remained in wetlands throughout the course of their gravidity.

The potential of the I-GOTU devices to provide quality data for studies such as this suggests further applications across a wide range of spatial-ecological studies. The data we collected during this study will allow managers to make better informed decisions about creation of new nesting areas and mitigation of road mortality, as we now have detailed information about crossing locations. The use of these units can be applied in other areas of the species' range and can be applied to other turtle species to provide similar conservation planning information. In the future, it might be informative to incorporate temperature sensors into tracking data to get a better idea of when individuals may have emerged from the water and on land nesting.

Acknowledgments:
This project was supported by State Wildlife Grants as administered by the New York State Department of Environmental Conservation, State University of New York at Potsdam, St. Lawrence River Research and Environmental Education Fund, and SUNY Research and Sponsored Programs.