Conservation and Management of Ornate Box Turtles (*Terrapene ornata*) at The Upper Mississippi River National Wildlife and Fish Refuge

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Abstract

In 2008, a long term comprehensive study of ornate box turtles (*Terrapene ornata*) was implemented within the sand prairies of the Upper Mississippi River National Wildlife and Fish Refuge (UMRNWFR) in northwest Illinois. In 2010, the study expanded to include two Illinois Nature Preserve sites and two private properties. The primary goals were to identify the population status of Ornates within these areas and to implement best management practices to protect this imperiled species. A secondary goal was to reestablish a viable population of Ornates in suitable sand prairie habitat at the Lost Mound Unit of the UMRNWFR. To date, field surveys have found fewer Ornate populations and smaller numbers of individuals within most populations than expected. Of the nine prairies surveyed, three contained no Ornates, three had only a few individuals, and three had viable populations. Radio transmitters are currently attached to 68 turtles located at four prairies to identify habitat use, home range size and hibernation characteristics. Through the use of automated telemetry, we are quantifying activity patterns and specific behaviors such as nesting events. We are also examining the efficacy of using radio transmitters with tilt sensors to quantify patterns of male courtship activity. Our nest predation study showed a mean predation rate of 30% with values as high as 56%. The first year of a head-start program was successful with the release of four turtles into the wild where the young turtles exhibited movement patterns similar to wild turtles and entered into hibernation when fall temperatures plunged. In 2011, we experienced a setback with our headstart program in which many of our eggs did not hatch. The animal care protocol has been modified to resolve the problem experienced in 2011. Habitat management techniques were adopted to protect and conserve Ornates. Environmental education programs were implemented to provide public awareness on the plight of this imperiled species. Project partners included local, state and federal agencies, conservation organizations, universities, zoos, youth groups, commercial developers and private land owners.

Introduction & Objectives

- 99% of sand prairies no longer exist in Illinois, once referred to as the "Prairie State"
- Sand prairie protection and restoration: a top priority by conservation organizations, state and federal agencies including the UMRNWFR
- Sand prairie species such as *Terrapene ornata* have experienced range-wide population declines
- Ornates: threatened or endangered in many states (habitat loss and fragmentation, predation)
- Refuge's Lost Mound Unit (formerly Savanna Army Depot) contains largest remnant sand prairie (over 1600 hectares) in Illinois
- Ornates nearly extirpated due to decades of military activity which eliminated all but a few

Objectives:

1: Identify the population status and dynamics of Ornates on the Refuge
2: Implement best management practices to conserve and protect Ornates
3: Reestablish a viable population of Ornates at Lost Mound Sand Prairie using translocation and head-start program
4: Use our data for state-wide Ornate recovery program

Project Partners & Acknowledgements

Iowa State University	Illinois Department of Natural Resources
Ashford University	U.S. Army Construction Engineering Research Laboratory
University of Wisconsin-Stevens Point	Jo-Carroll Local Redevelopment Authority
Drexel University (Tom Radzio)	IL Endangered Species Protection Board
Eastern Illinois University	Conservation Guardians of Northwest IL
University of Wisconsin-Madison	Brigham Young University-Idaho
Riverport Railroad	U.S. Fish and Wildlife Service
Missouri State University	Lost Mound Corps of Discovery
Advanced Telemetry Systems	Wildlife Materials
Sparrow Systems (auto telemetry designer)	Niabi Zoo and Lincoln Park Zoo
U.S. Army Corps of Engineers	Ecological Society of America

Education & Outreach: Management Implications

Boy & Girl Scouts of America Various elementary, high school, and college class tours, student internships

"Jeramie, I saw your published Ornate Box Turtle article in The Outdoor IL Magazine, and it was actually what pushed me to apply to graduate school and help Nachusa Grasslands (Nature Conservancy) figure out the best way they could contribute to box turtle conservation" –Kimberly Schmidt

Head-start Program: Re-establishing a Viable Population

- Head-starting is the process of finding gravid females, injecting them with oxytocin to induce egg laying, incubation of eggs until hatching, and raising hatchlings in captivity
- Despite criticisms and objections, head-starting is a prominent and promising tool for conservation in recovery plans of several threatened or endangered turtle species (Shaver 2005, Sprinks 2003)

Goal: Re-establish a viable population of Ornates at Lost Mound Sand Prairie
- largest remnant sand prairie/savanna in Illinois containing over 1,600 hectares

- September 2010: four 13 month head-start Ornates were released at Lost Mound after being raised at Niabi Zoo
- June 2011: - one gravid turtle laid five eggs which were incubated at Niabi Zoo
  - five gravid turtles laid 20 eggs which were incubated at Lincoln Park Zoo

Nest Predation Study

- Nest predators can influence the demographic structure of turtle populations.
- We investigated cues used by predators to locate artificial turtle nests in habitats heavily used by several turtle species.
- We attempted to assess the influence of olfactory cues on nest depredation using coyote urine, Ornate scented sand, and painted turtle eggs.
- We also determined if predators use visual cues (soil disturbance) to detect turtle nests.
- Overall, 30% of the 126 simulated nests suffered predation, but ranged from 30-56%.
- The presence of coyote urine, Ornate scented sand, painted turtle eggs, combined or individually did not significantly alter predation rates.
- Instead predators (primarily raccoons) seemed to locate nests based solely on surface soil disturbance

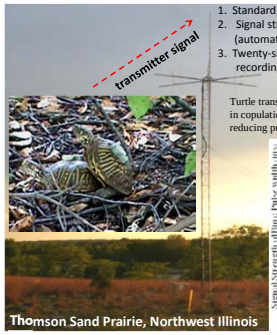
Modeling for Management: Population Viability Analysis

- PVA is a tool that can be used to evaluate management options and the effects of changes to a population.
- A PVA is a mathematical way of estimating the outcome of changes to a population by statistical means.
- PVAs use known variables of a species, (e.g. initial population numbers, birth rates, death rates by age, predation, breeding).
- This information can be used by managers and scientists to investigate life cycles of a species without affecting the species itself and choose the best method of dealing with the species and their environment.
- We used this tool and analysis to evaluate the impact of harvest on one Ornate population and the effect of introduction of another; and to validate the chance of success for our Ornate head-start program.

Thermal Constraints on Behavior and Habitat Use

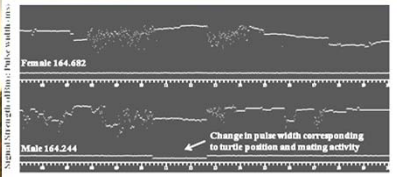
- Ornates are unable to seek the refugia of cool water when their body temperatures rise, meaning that they must seek refuge underground or in the sparse shade
- Ground surface temperatures commonly reach 130 °F, which can be quickly lethal to turtles unless they seek thermal refugia.
- By placing temperature dataloggers on turtles and pairing these readings with an index of turtle activity, we hope to identify the thermal thresholds of Ornate activity in different habitat types and determine the environmental temperatures at which they are active.
- Currently, we have 30 temperature loggers attached to Ornates to gather thermal data.
- This will help managers decide temperatures when habitat management activities can be performed without the threat of harming active turtles.

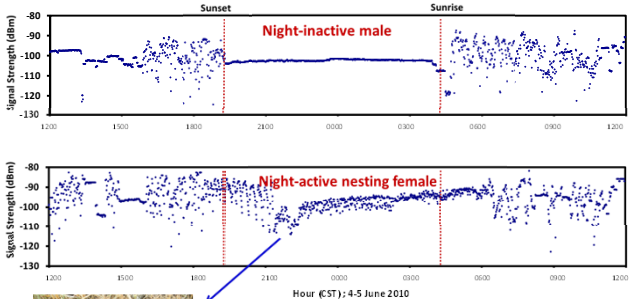
Automated Radio Telemetry: Quantifying Activity and Behavior



1. Standard radio transmitters affixed to turtles
2. Signal strengths recorded at 1-2 min intervals from computer (automated receiving units) on stationary 30 foot towers
3. Twenty-six free-ranging turtles video taped to compare activity and radio signal strength recordings

Turtle transmitter signal strength (amplitude) and pulse width recordings for two turtles observed in copulation at 1237 h on July 31, 2010. The male's tilt transmitter functioned as designed by reducing pulse frequency when the male was in the copulation position.





Nest confirmed next

- 14 nests found in 2010

- 14 nests (49 eggs) found in 2011, along with several gravid females which were used for head-start program

Transmitter signal strength recordings for a male (top) and female (bottom) Ornate Box Turtle from 4-5 June 2010. Note night activity by the female, which we visually confirmed to correspond with nesting.

Best Management Practices: Species Conservation Implications

An important goal of our comprehensive Ornate study is to implement habitat management techniques that would improve sand prairie habitat without impacting the turtles.

- Prescribed burning as a grassland management tool (timing is critical)
- Firebreak maintenance requires discing and mowing of grasslands to prevent wildfire hazard
- Woody encroachment (e.g. red cedar and black locust removal)
- Roadside and trailside maintenance (rotary mowers, sickle bar mowers)