



Assessing Bridge Characteristics for Use and Importance as Roosting Habitats for Bats

tech transfer summary

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RESEARCH PROJECT TITLE

Assessing Bridge Characteristics for Use and Importance as Roosting Habitats for Bats

SPONSORS

Iowa Department of Transportation
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The mission of the Bridge Engineering Center is to conduct research on bridge technologies to help bridge designers/owners design, build, and maintain long-lasting bridges. The mission of the Center for Transportation Research and Education is to develop and implement innovative methods, materials, and technologies for improving transportation efficiency, safety, reliability, and sustainability while improving the learning environment of students, faculty, and staff in transportation-related fields.

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This study identified the bridge characteristics that increase the likelihood of bat roosting at bridges in order to better understand and predict bats' habits to aid in conservation efforts.

Problem Statement

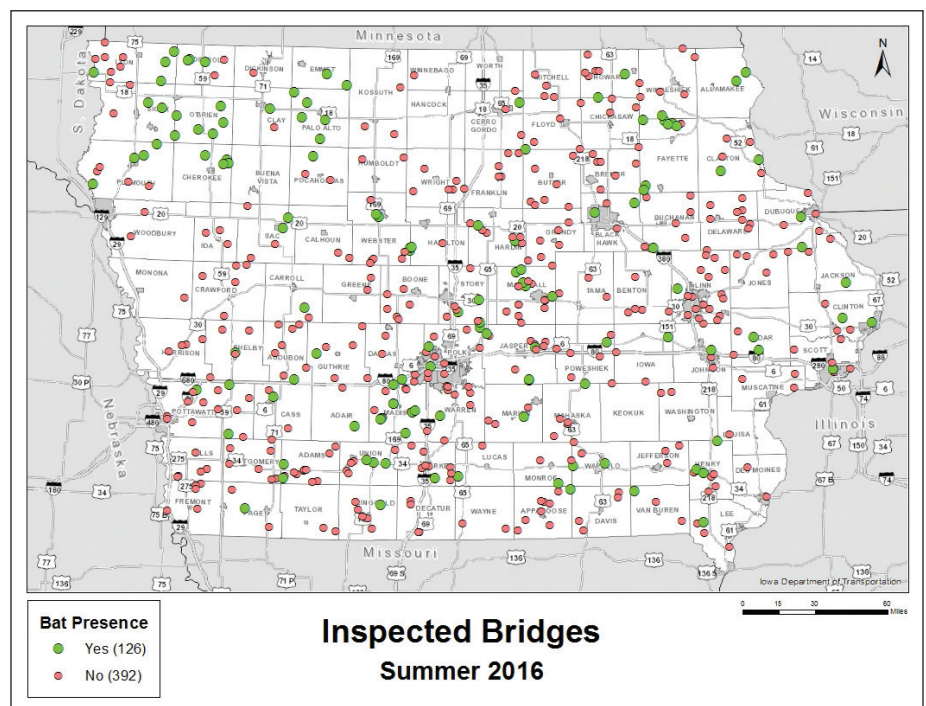
Although it is widely accepted that bats use bridges as roosting sites, little attention has been given to understanding the bridge, bat distribution, and location characteristics associated with use of bridges as roosting sites. Therefore, it is important to investigate how, why, and when bats use bridges as roosting sites.

Goal and Objectives

The major goal for this study was to better understand when bridge replacement, repair, and rehabilitation projects have the potential for "taking" (i.e., harassing, injuring, or killing) federally threatened or endangered bat species.

To achieve that goal, the project had the following objectives:

- Better understand what type of bridges, based on bridge characteristics including local topography and habitat availability, are the most likely to be used by bats as roosting locations
- Document the methods developed and followed in this study so that the evaluation protocol can be exported to other states and regions



Map of all structures inspected during the course of this study, with green dots representing the bridge locations containing bat presence



Background

There has been growing concern about the bat population in the US, mainly due to the outbreaks of White-Nose Syndrome (WNS) and collisions with wind turbine blades. Concerns over the declines in the bat population are also driven by the fact that habitats used by bats for roosting and foraging have been disturbed, altered, or reduced.

Bat conservation efforts have been hampered by a lack of information on how to provide suitable environments, especially at critical roosting times (e.g., maternal roosting). Further complicating the situation is that some locations may be used only for brief time durations and sometimes for specific usages (hibernation, maternity, etc.).

In Iowa, at least one federally endangered bat (the Indiana bat) is known to exist and thought to be potentially impacted by habitat influences.

Project Description

The research team established the general types of land cover characteristics and structure characteristics that bats generally prefer and where those types of bridges exist in Iowa through a literature review and data provided by sources such as the National Gap Analysis Program, National Bridge Inventory, and data collected during field inspections.

The research team randomly sampled and inspected 517 structures as part of the study. The field inspection process took place during the summer of 2016, where trained teams acquired detailed evidence of bat roosting at bridges.

The evidence could include bat droppings, visual sightings of flying bats, or presence of roosting bats. The teams also collected other data such as roost type, roost dimensions, conditions surrounding the roost, and surrounding habitat. Items supplementing each inspected bridge structure included photographic and documented indications of the existence or inexistence of bats.

Once all the data were collected, the team used logistic regression models to estimate the probability of bat presence based on bridge characteristics, potential bat presence, land cover, and field-collected data items.

Key Findings

The final model indicated the probability of bat roosting on bridges increased significantly when structures met the following conditions:

- Prestressed concrete continuous, prestressed concrete, or steel continuous
- Increased superstructure height above ground
- Increased superstructure depth
- Increased wetland coverage within 0.1 mile radius of the structure
- Increased number of potential bat species at the location

The findings showed that bridge characteristics, combined with land cover and bat species distribution data, can help identify locations with higher probabilities of bat roosting.

To the authors' knowledge, the integration of objective graphic information system-based (GIS-based) land cover data with potential bat presence data, and estimation of quantitative and relative influence of variables on probability of bat roosting are unique to this study.

Implementation Readiness and Benefits

The results of this work can be useful to transportation agencies as they plan bridge replacement, repair, and rehabilitation projects and can help conservation efforts targeted toward bats. The findings provided the Iowa Department of Transportation with the ability to proactively identify locations with a high likelihood of bat roosting.

In addition, the study can be adapted and performed by any other state or agency. To aid in the effort, the project team put together an instructional video on inspections for bat roosting at bridges. The video can be accessed at this [link](#).

Recommendations

- It is important to have an interdisciplinary project panel that can provide input to the researchers throughout their studies.
- It is critical to have a random sample of bridges for inspections, in order to have an unbiased sample that can be later used in statistical analysis. Researchers may add other variables that are relevant to their locations to this list.
- Researchers may use other statistical models or analyses based on the findings they are interested in, or may add other questions of interest.

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