

**NEVADA DEPARTMENT OF TRANSPORTATION**  
**RESEARCH PROBLEM STATEMENT**

**Internal Submission Form (not to exceed 3 pages with font size 11)**

**I. PROBLEM TITLE:**

An assessment of bat use of NDOT-managed transportation structures

**II. PROBLEM DESCRIPTION:**

Adequate roosting habitat is an important component for thriving bat populations, many of which are in decline across the United States. As natural bat roosts are being lost in many areas, the value of artificial or manmade bat roost habitat, such as bridges and culverts, is increasing. A study in Montana found that 60% of highway structures surveyed had evidence of bat use (Hendricks et al. 2005) while studies in other states found from 5-75% of structures surveyed being used by bats (Lamb et al. 2022 and Bender et al. 2010 as found in Wetzal et al. 2023). In addition to bats roosting in the crevices and holes common in bridges and culverts, recent research suggests that bats may also use swallow nests, which are commonly found on bridges. Transportation structure use has the potential to be substantial, with 22 of the 23 species of bats found in Nevada having been observed or having potential to roost in bridges (White-nosed Syndrome Conservation and Recovery Working Group 2018). The studies cited above and in section IV suggest that bats may rely on bridges and culverts in higher numbers than originally suspected, and transportation structures may serve as significant diurnal, nocturnal, maternity, hibernation, and transitory roosts.

The Nevada Department of Transportation (NDOT) maintains over 2,000 bridges and 52,000 culverts which have the potential to provide roosting habitat for bat species. Of those structures, the Nevada Department of Wildlife (NDOW) and NDOT are aware of several serving as bat roosts; however, no systematic surveys of bat occupancy of such structures have been conducted in Nevada. As all native bat species are protected in the state of Nevada (NAC 503.110) and two bat species that live in the state are under or scheduled for review for listing status and protections under the Federal Endangered Species Act (ESA), it is important to understand which structures are being used by bats and how. In addition, knowledge of the types and locations of bat roosts will allow NDOT to adequately prepare for work on these structures, avoiding costly last minute mitigation measures, project delays, and the possibility of bat endangerment and inadvertent noncompliance with regulations.

**III. OBJECTIVE:**

The primary objective of this research is to assess NDOT-managed transportation structures such as bridges, culverts, tunnels, and similar structures, as well as associated walls and guardrails, across the state for use by bats. An examination of this topic will provide an understanding of the types of transportation structures that are being used, as well as how, when, and by what species. Deliverables will include a literature review, a spatial data set of the field survey results, and a final report. Furthermore, a Bat Management Plan document will be produced to help NDOT personnel determine bat occupancy at transportation structures, in addition to offering guidance on proper avoidance and minimization measures.

The proposed research will include at a minimum:

1. A literature review of bat use of transportation structures. This literature review will describe the transportation structure characteristics generally considered necessary to provide roosting habitat and assess the potential for those characteristics in Nevada. The results of this

- literature review will be compiled, and hypotheses developed into a synthesis report prior to initiating field surveys.
2. Surveys of a selection of transportation structures across the state (with all three NDOT districts represented) using existing guidance and protocols to determine bat use down to species level. Bridges and culverts will be represented in the surveys as well as any associated structures such as guard rails or concrete barriers, etc. in the immediate area. A subset of structures should also be surveyed multiple times in different seasons.
    - a. The research team will need to work with NDOT and NDOW to determine which NDOT structures to survey, and this list will need final approval by NDOT.
    - b. Species identification may require use of novel techniques such as fecal testing.
  3. A final report detailing research methodologies, findings, conclusions, as well as a spatial data set of the results.
  4. A Bat Management Plan for NDOT that includes best management practices for surveying and determining bat use of transportation structures. This document should include guidance on acceptable mitigation measures for NDOT's various construction and maintenance activities taking place on transportation structures within NDOT right-of-way.

#### **IV. CURRENT PRACTICE and RELATED RESEARCH:**

The current practice to determine bat use of a structure prior to bridge and culvert projects is to conduct a brief survey to look for signs of use immediately prior to project implementation. This method of detecting bat presence has helped to identify large bat roosts in several locations in Nevada. However, as these surveys are traditionally conducted at a convenient time for project delivery, seasonal bat roosts may be missed. Likewise, hibernating bats and smaller groups of bats do not leave as much evidence of occupancy, such as guano, behind and may be missed by brief or incomplete inspections. Bats that are missed during pre-project surveys are left vulnerable to construction activities. Risks to bats include mortality, injury, and harassment; all of which go against state regulations.

To reduce costs, project delays, and bat mortality, the Association of Fish and Wildlife Agencies recently published a resolution (2023-05-07) that acknowledges the importance of collaboration between state wildlife agencies and their associated state departments of transportation in determining bat presence on all bridge and culvert projects before any maintenance or demolition occurs. States such as Georgia, California and New Jersey have successfully led the way and a framework for survey protocols already exists, thanks to collaborative efforts between state DOTs, state wildlife agencies, and the U.S. Fish and Wildlife Service, particularly in the eastern U.S. (Schuhmann et al. 2024, White-nosed Syndrome Conservation and Recovery Working Group 2018, and more resources available at <https://drive.google.com/drive/folders/1lw2MhgikPG-aYtnAJexHZQKw--x-HUm0>). However, just as each state has its own list of bat species and habitat types, how bats are using transportation structures may vary in different localities, habitats, and climates. This variation needs to be assessed at local scales. For example, Nevada's unique desert environments may have limited resources available to bat populations potentially causing higher than expected use of transportation structures; or possibly lower than expected use due to smaller population sizes. Initial surveys conducted by NDOT in 2024, in partnership with NDOW, indicate that approximately 25% of structures surveyed display signs of bat use. NDOW supports further surveys and analysis to gain a better understanding of bat use of transportation structures in Nevada.

NDOT currently requires construction personnel contact an NDOT biologist, or NDOW, if a bat is found on a project. Work is to be avoided within 100 feet of the bat until the situation can be investigated by a biologist. Given that this is a reactive response, discovering a bat roost during construction may cause significant project delays, potentially lasting hours to months, depending

on the type of roost discovered. Identifying and predicting bat use of structures during the project planning phase can reduce the number and duration of project delays, while better complying with state law.

**V. IMPLEMENTATION POTENTIAL:**

The proposed research falls under the “Concept Stage” for the literature review, followed by the “First Application (Contract) Field Pilot Stage” for the surveys. Furthermore, the results and proposed deliverables have the potential to fall under the “Specification and Standards with Full Corporate Deployment Stage”. We are not aware of any institutional, political, or socio-economic barriers to implementation of the anticipated research.

**VI. URGENCY and PAYOFF POTENTIAL:**

As bat species continue to decline in the United States and further protections are put into place, it is imperative that NDOT gain an understanding of bat use of bridges and culverts in the state. Such understanding will allow projects and maintenance activities to be appropriately mitigated to avoid costly delays, which can be a public safety concern, and will allow the Department to fulfill state requirements for the protection of bat species. For example, in the few Nevada bridges that have been assessed for bat use, one has been found to be an important little brown bat (*Myotis lucifugus*) maternity roost and another an important stopover site for thousands of Mexican free-tailed bats (*Tadarida brasiliensis*). These roosts require seasonal work restrictions and exclusionary measures to be implemented, which need to be planned out and executed in advance of construction. Furthermore, gaining knowledge of how bats are using structures and augmenting bat mitigation efforts may have significant impacts and help inform management actions if the presence of Pd (*Pseudogymnoascus destructans*), the fungus that causes white-nose syndrome, spreads to Nevada.

The current data on bat use of bridges in Nevada is limited. Therefore, it is important to understand bat use of transportation structures in the state and identify best management practices to help NDOT adapt to, and stay in compliance with, all regulations. Additionally, all bat species in Nevada, except the yellow bat (*Lasius intermedium*), have the potential to occupy transportation structures. Managers need a better understanding of such use to properly plan for projects and maintenance activities.

**VII. DATE and SUBMITTED BY:**

9/26/2024

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# FIVE STAGES OF RESEARCH DEPLOYMENT

*Based on Caltrans Research and Innovation Stages*

## 1. Concept Stage

- First steps following Problem Statement and Proposal Development
- Includes detailed literature search
- Involves experimental design, data collection, analysis, and reporting
- Assesses results of research
- Defines barriers to implementation (e.g., policies, specifications, standards)
- Submits a Final Report and outlines a recommended implementation plan
- Includes collaboration with outside agencies or other state DOTs and US DOT (Applies to all Stages of Deployment)

## 2. Laboratory Prototype Stage

- Develops breadboard circuit or computer system modeling
- Demonstrates operation in laboratory setting
- May incorporate customized or one-of-a kind components
- Assesses results
- Submits Final Report and recommends design of full-scale demonstration
- Potential end users are enlisted to support the field pilot stage

## 3. Controlled Field Demonstration Stage

- Prepares for full scale testing of demonstration project
- Controlled tests at specialized facilities are observed and supported by cooperating agencies, industry, and technical associations
- Potential end users are enlisted to support the field pilot stage
- Assesses results
- Submits Final Report and recommends site/conditions for first application pilot stage

## 4. First Application (Contract) Field Pilot Stage

- Works with potential end users to select site and to conduct pilot testing under real world operating conditions
- Test specifications and standards are developed
- Research assistance given to assure proper installation and operation
- Problems are corrected and adjustments made, as necessary, to complete pilot testing
- To the extent possible, potential end users operate the project under careful research surveillance
- Assesses results
- Submits Final Report and recommends initial sites for full corporate deployment
- Potential end users are enlisted to support the field pilot stage

## 5. Specification & Standards with Full Corporate Deployment Stage

- End users select site(s) and deploy the method/process/equipment using resident management, supervision, staff, and contracting forces (where applicable)
- Deployment is without research supervision or direction
- On call assistance is available upon request
- Assesses results