

**Environment and Natural Resources Trust Fund**

# 2022 Request for Proposal

## **General Information**

**Proposal ID:** 2022-215

**Proposal Title:** What’s Causing Declines in Black Bear Reproduction

## **Project Manager Information**

**Name:** Andrew Tri

**Organization:** MN DNR - Fish and Wildlife Division

**Office Telephone:** (218) 328-8879

**Email:** andrew.tri@state.mn.us

## **Project Basic Information**

**Project Summary:** We will examine why bear reproduction has declined in central and northwestern Minnesota using citizen-science to collect samples from hunters to assess reproduction, health, and exposure to disease and pesticides.

**Funds Requested:** $553,000

**Proposed Project Completion:** December 31 2025

**LCCMR Funding Category:** Foundational Natural Resource Data and Information (A)

## **Project Location**

**What is the best scale for describing where your work will take place?** Statewide

**What is the best scale to describe the area impacted by your work?** Statewide

**When will the work impact occur?** During the Project

## **Narrative**

**Describe the opportunity or problem your proposal seeks to address. Include any relevant background information.**

Of all of Minnesota’s mammals, bears take the longest to reach reproductive age (5 years, on average, before their first litter). Over the past 20 years, black bear reproduction on the edge of bear range (a 75-mile wide band of habitat that spans from Roseau to Forest Lake) has declined. Based on statewide estimates from hunter-submitted bear teeth, bears on the edge are delaying age of first reproduction for one full year, while reproduction in the core of bear range, the northeast 2/5ths of Minnesota has been stable since the 1970s. After bears have their first litter, they typically reproduce every two years; however, delaying first reproduction can greatly impact the population, including a 20% drop in lifetime female reproductive potential. The edge of bear range has more oak forest and agriculture (i.e., more crops for bears to eat) than the core, and until the last 2 decades, was the most productive bear population in the state (bears there used to reproduce at 4 years, on average). It is unclear why the delay in reproduction is not occurring systematically across the entire state, though food availability (and quality), disease, or pesticide exposure may play a role.

**What is your proposed solution to the problem or opportunity discussed above? i.e. What are you seeking funding to do? You will be asked to expand on this in Activities and Milestones.**

Our previous research has documented that 40% of the bear management units in Minnesota are showing declines in reproduction and it is unclear why. To resolve this uncertainty, we will collect samples from hunter-harvested bears from across the state. Minnesota bear hunters have participated in citizen-science research with the DNR since the 1980s. We’ve had >80% tooth submission rates from hunters over the past 5 years. First, we will compare age-specific pregnancy rates, body condition, and body weights of adult bears between the core and the edge of their range to determine if the reproductive decline is caused by failure to reach sufficient body condition to enter estrus or failure in utero. Second, we will assess if bears have shifted their diets and estimate their exposure to zoonotic disease or pesticides. If bears have begun consuming more foods from anthropogenic sources, such as hunters’ baits, trash, birdseed, or agriculture (crops), that would indicate (1) natural foods have declined, (2) bears had to consume other foods to make up the difference, and (3) by consuming more crops or baits, they may be exposed to more pesticides or have increased exposure with other animals at hunters’ baits.

**What are the specific project outcomes as they relate to the public purpose of protection, conservation, preservation, and enhancement of the state’s natural resources?**

Minnesota offers some of the best bear hunting in the nation (~60% success rate in 2020), and it is imperative that DNR manages for a resilient bear population. A healthy bear population will offer sustainable hunter opportunities, which brings in tourism dollars to outstate Minnesota. The work in this proposal will help us understand why reproduction is declining and how to mitigate those impacts. We can adjust management strategies to accommodate changing reproductive conditions (e.g., adjust forest management or set alternative harvest quotas and regulations), but to do so, we need a greater understanding of regional and statewide bear reproduction.

## **Activities and Milestones**

### **Activity 1: Determine pregnancy rates and reproductive status of bears along the edge and in the core of bear range.**

**Activity Budget:** $135,500

**Activity Description:**Using citizen science, we will ask bear hunters and bear guides to provide reproductive tracts and fresh blood from harvested bears to determine pregnancy rates and reproductive history. We will use hunter check stations to collect additional samples. We will collect the reproductive tracts (uterus, ovaries, and fallopian tubes), which will provide average size of past litters and overall reproductive success. We will also assess body weight differences between bears in the core and at the edge of bear range, and compare this against historical bear weights taken from harvest data and prior check stations in the 1980s.

**Activity Milestones:**

|  |  |
| --- | --- |
| **Description** | **Completion Date** |
| Obtain reproductive tracts from 2 years of hunter-harvested black bears | December 31 2023 |
| Obtain weights of hunter harvested bears for 2 hunting seasons | December 31 2023 |
| Read repro tracts to assess pregnancy rates, reproductive success, and litter size | September 30 2024 |
| Analyze data | December 31 2024 |
| Interpret results, write dissertation chapter, write final report | December 31 2025 |

### **Activity 2: Assess diets from bear hair and determine exposure to pesticides and zoonotic diseases from blood and tissue samples.**

**Activity Budget:** $417,500

**Activity Description:**We will use stable isotope chemistry to assess the diet composition of hunter-provided bear hair and compare against historical samples from our long-term bear monitoring study. We will ask hunters and bear guides to provide tissue samples and hair from harvested bears to assess potential exposure to pesticides and disease. We will also analyze a subset of historically collected hair and blood samples.

**Activity Milestones:**

|  |  |
| --- | --- |
| **Description** | **Completion Date** |
| Obtain 2 years of harvested bear hair to assess differences in diet composition across Minnesota | December 31 2023 |
| Obtain fresh blood and tissue samples for 2 years from hunter-harvested bears | December 31 2023 |
| Send samples to lab for analysis of historically collected hair from radio-collared bears | April 30 2024 |
| Send samples to lab for analysis of exposure to pesticides and disease | April 30 2024 |
| Send samples to lab for analysis of pesticide exposure to neonicotinoids in blood and tissue | April 30 2024 |
| Data analysis | December 31 2024 |
| Interpret results, write dissertation chapter, write final report | December 31 2025 |

## **Project Partners and Collaborators**

|  |  |  |  |
| --- | --- | --- | --- |
| **Name** | **Organization** | **Role** | **Receiving Funds** |
| Dr. Andrew Tri | Minnesota Department of Natural Resources | Project Manager | Yes |
| Dr. Michelle Carstensen | Minnesota Department of Natural Resources | Co-investigator | No |
| Dr. David Anderson | University of Minnesota - Twin Cities, MN-USGS Cooperative Fish and Wildlife Research Unit | Co-investigator who will supervise graduate student on the study | Yes |
| Kelsie LaSharr | Minnesota Department of Natural Resources | Co-investigator | No |
| Dr. John Buchweitz | Michigan State University | Conduct mass spectrometry analysis on spleen samples to determine neonicotinoid prevalence and concentrations | Yes |
| Dr. Krysten Schuler | Cornell University Animal Health Diagnostic Center | Conduct serum analysis to determine disease exposure | Yes |
| Dr. Kim Sparks | Cornell Stable Isotope Laboratory | Analyze hair samples using stable isotope chemistry to assess bear diet | Yes |

## **Long-Term Implementation and Funding**

**Describe how the results will be implemented and how any ongoing effort will be funded. If not already addressed as part of the project, how will findings, results, and products developed be implemented after project completion? If additional work is needed, how will this be funded?**This project will provide data and assessments for what may be causing reproduction declines in black bears, along with suggested management actions to reduce impacts on the population. Once we determine the causes of reproductive decline, we will be able to suggest management changes to help mitigate the effects and increase resiliency in the bear population. This work will enable us to answer a question we are unable to fund with internal funding and will be integrated into our long-term bear population dynamics and monitoring. Ongoing effort beyond this proposal will be supported by internal DNR funding sources.

## **Project Manager and Organization Qualifications**

**Project Manager Name:** Andrew Tri

**Job Title:** Acting Bear Project Leader

**Provide description of the project manager’s qualifications to manage the proposed project.**Dr. Tri is the Acting Bear Project Leader for the DNR. He has a B.S. in Fisheries and Wildlife from the University of Minnesota-Twin Cities, an M.S. in Range and Wildlife Science from Texas A & M University-Kingsville, and a PhD Forest Resource Management (Wildlife Track) from West Virginia University. Dr. Tri has been working with black bears since 2010 and has been working with bears in Minnesota since 2015. He’s responsible for leading research about the survival, reproduction, ecology, movement, human-bear conflicts, and bear harvest management to provide science-based recommendations for bear management in Minnesota.

**Organization:** MN DNR - Fish and Wildlife Division

**Organization Description:**The mission of the Minnesota Department of Natural Resources (DNR) is to work with Minnesotans to conserve and manage the state's natural resources, to provide outdoor recreation opportunities, and to provide for commercial uses of natural resources in a way that creates a sustainable quality of life. The role of the DNR Forest Wildlife Populations and Research Group is to provide inventory information on wildlife populations, project how populations will respond to management, and develop a better understanding of how populations are impacted by changes in their environment. The forests of northern Minnesota create their own special blend of problems for wildlife managers and it is the responsibility of this group to help solve these problems. Important wildlife species such as white-tailed deer, moose, black bear, grouse and furbearers are particularly difficult to inventory because of the enormous area they inhabit and the difficulty in observing these species in a forested environment. For these reasons, most species are monitored with a combination of surveys and computer simulation models. The group is responsible for designing and coordinating surveys and analyzing results. They have developed population models for most species that allow wildlife managers to project the outcome of specific management practices.

## **Budget Summary**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Category / Name** | **Subcategory or Type** | **Description** | **Purpose** | **Gen. Ineli gible** | **% Bene fits** | **# FTE** | **Class ified Staff?** | **$ Amount** |
| **Personnel** |  |  |  |  |  |  |  |  |
| 2 Lab Technicians (4 months/year, 2 years) |  | Technicians to process hair, blood, and tissue samples |  |  | 0% | 1.34 |  | $56,000 |
|  |  |  |  |  |  |  | **Sub Total** | **$56,000** |
| **Contracts and Services** |  |  |  |  |  |  |  |  |
| Michigan State University | Professional or Technical Service Contract | Neonicitinoid sampling, mass spectroscopy (500 samples/year @ $100/sample for 2 years) |  |  |  | - |  | $100,000 |
| Cornell University Veterinary Diagnostic Lab | Professional or Technical Service Contract | disease and hormone testing (toxoplasmosis, canine adenoviruses, Brucella, and progesterone [250 samples/year + 150 historical samples/year for 2 years @$145/sample) |  |  |  | - |  | $116,000 |
| Cornell University Stable Isotope Laboratory | Professional or Technical Service Contract | Hair analysis for bear diets. ($10/sample x 2000 samples/year x 2 years + 1000 historical samples) |  |  |  | - |  | $50,000 |
| University of Minnesota | Sub award | Advising of the graduate student (3 years) |  |  |  | - |  | $141,000 |
|  |  |  |  |  |  |  | **Sub Total** | **$407,000** |
| **Equipment, Tools, and Supplies** |  |  |  |  |  |  |  |  |
|  | Tools and Supplies | Laboratory supplies (reagents and slides; $750/year for 2 years) | Supplies to conduct genotoxicity screening |  |  |  |  | $1,500 |
|  | Equipment | 1 Laboratory Microscope with camera | To conduct genotoxicity screening |  |  |  |  | $3,000 |
|  | Tools and Supplies | Supplies for 4 check stations (scales, block and tackle, gambrel hoists, signs, blood and tissue sample equipment) | Items are used to operate hunter check stations to collect weight, tissue samples, and hunter information |  |  |  |  | $6,000 |
|  | Tools and Supplies | Supplies for hunter sampling kits and return shipping ($25,000/year) | Prepackaged kits for hunters to collect organs, hair, and blood from harvested bears to participate in the citizen science project |  |  |  |  | $50,000 |
|  |  |  |  |  |  |  | **Sub Total** | **$60,500** |
| **Capital Expenditures** |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  | **Sub Total** | **-** |
| **Acquisitions and Stewardship** |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  | **Sub Total** | **-** |
| **Travel In Minnesota** |  |  |  |  |  |  |  |  |
|  | Miles/ Meals/ Lodging | Trips to collect samples, travel to check stations each year (fleet @$0.55/mi, estimated 5,000 miles/year), meals and lodging ($6000/year \* 2 years) | Travel to check stations and sample collections by check station staff and volunteers |  |  |  |  | $18,152 |
|  |  |  |  |  |  |  | **Sub Total** | **$18,152** |
| **Travel Outside Minnesota** |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  | **Sub Total** | **-** |
| **Printing and Publication** |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  | **Sub Total** | **-** |
| **Other Expenses** |  |  |  |  |  |  |  |  |
|  |  | Direct and Necessary costs | Direct and necessary costs cover HR Support ($2,230),Safety Support ($345), Financial Support ($1,708), Communication Support ($1,311), IT Support ($4,745), and Planning Support ($1,008) |  |  |  |  | $11,348 |
|  |  |  |  |  |  |  | **Sub Total** | **$11,348** |
|  |  |  |  |  |  |  | **Grand Total** | **$553,000** |

### **Classified Staff or Generally Ineligible Expenses**

|  |  |  |  |
| --- | --- | --- | --- |
| **Category/Name** | **Subcategory or Type** | **Description** | **Justification Ineligible Expense or Classified Staff Request** |

### **Non ENRTF Funds**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Category** | **Specific Source** | **Use** | **Status** | **Amount** |
| **State** |  |  |  |  |
| In-Kind | Salary and fringe for Andrew Tri, supplied by MNDNR | MNDNR Forest Wildlife Populations & Research Group: Andrew N. Tri, project management, fieldwork, data analysis, writing, outreach; 36 mos, 15% effort | Secured | $39,083 |
| In-Kind | Salary and fringe for Michelle Carstensen, supplied by MNDNR | MNDNR Wildlife Health Program: Michelle Carstensen, project management, field necropsies, analyze, write, outreach; 36 mos, 5% effort | Secured | $19,500 |
| In-Kind | Salary and fringe for Kelsie LaSharr, supplied by MNDNR | MNDNR Wildlife Health Program: NR Spec-Intermediate Kelsie LaSharr, sample kit preperation, distribution, biological sample coordination; 36 months 30% effort | Secured | $62,011 |
|  |  |  | **State Sub Total** | **$120,594** |
| **Non-State** |  |  |  |  |
|  |  |  | **Non State Sub Total** | **-** |
|  |  |  | **Funds Total** | **$120,594** |

## **Attachments**

### **Required Attachments**

#### ***Visual Component***

File: [231d9494-601.pdf](https://lccmrprojectmgmt.leg.mn/media/map/231d9494-601.pdf)

#### ***Alternate Text for Visual Component***

Figure shows a map of Minnesota, in which bear populations in the northeastern one-third of the state have had stable age of first reproduction, but bear populations in the middle third of the state and the northwest part of the state have delayed reproduction between 0.5-1.1 years. There is a photo of a yearling bear laying on a tree limb and a picture of a female collared bear with a cub next to her....

## **Administrative Use**

**Does your project include restoration or acquisition of land rights?**   
 No

**Does your project have potential for royalties, copyrights, patents, or sale of products and assets?**   
 No

**Do you understand and acknowledge IP and revenue-return and sharing requirements in 116P.10?**   
 N/A

**Do you wish to request reinvestment of any revenues into your project instead of returning revenue to the ENRTF?**   
 N/A

**Does your project include original, hypothesis-driven research?**   
 Yes

**Does the organization have a fiscal agent for this project?**   
 No