



Environment and Natural Resources Trust Fund

M.L. 2025 Approved Work Plan

General Information

ID Number: 2025-127

Staff Lead: Becca Nash

Date this document submitted to LCCMR: June 26, 2025

Project Title: Green Heron as an Indicator of Wetland-Dependent Species

Project Budget: \$424,000

Project Manager Information

Name: Elena West

Organization: U of MN - College of Food, Agricultural and Natural Resource Sciences

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Project Reporting

Date Work Plan Approved by LCCMR: June 24, 2025

Reporting Schedule: June 1 / December 1 of each year.

Project Completion: June 30, 2028

Final Report Due Date: August 14, 2028

Legal Information

Legal Citation: M.L. 2025, First Special Session, Chp. 1, Art. 2, Sec. 2, Subd. 03m

Appropriation Language: \$424,000 the first year is from the trust fund to the Board of Regents of the University of Minnesota to collect data on the year-round habitat use and migratory movements of green herons, assess potential factors leading to population decline, and identify conservation strategies to benefit the green heron and other wetland-dependent bird species.

Appropriation End Date: June 30, 2028

Narrative

Project Summary: Green Herons have declined across much of their range. Information on their annual cycle habitat use and migratory movements is needed to understand and address conservation concerns for wetland-dependent birds.

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

The loss or degradation of wetland habitats may be a key factor in the decline of many wetland-dependent species that rely on these habitats for breeding, foraging, and migratory stopover habitat. These species are often difficult to study due to their cryptic habits and use of brushy, forested wetlands, which can impede detection. Despite their widespread distribution and use of diverse wetland habitats, Green Herons are in steep decline across much of their range. In Minnesota, recent gains in wetland acreage may support wetland-dependent species like Green Herons, but significant gaps in our understanding of this species' breeding, wintering, and migratory habits (i.e. annual cycle) inhibits conservation efforts. By following green heron movements throughout their annual cycle, our project will help us to determine their use of habitats in Minnesota (including newly created wetlands) and to evaluate potential factors related to their rangewide decline (e.g., degradation of wetland habitats on the wintering grounds or at stopover sites). We will also assess their co-occurrence patterns with other important wetland-dependent species in Minnesota, including Belted Kingfishers, Black-billed Cuckoos, and Yellow-billed Cuckoos, and thus, whether they may serve as an important indicator species for other wetland-dependent bird species in the state.

What is your proposed solution to the problem or opportunity discussed above? Introduce us to the work you are seeking funding to do. You will be asked to expand on this proposed solution in Activities & Milestones.

This study will provide critical information on the ecology of Green Herons, particularly their use of wetland habitats during the annual cycle, including migration. First, we will mark and monitor individuals from breeding populations in Minnesota using GPS satellite tracking technology. Data derived from marked birds will allow us to identify important regions for Green Herons during post-breeding, migration, and wintering periods and quantify habitats used during the full annual cycle. Resulting information can be used to identify potential factors influencing population dynamics and conservation strategies to benefit Green Herons and other wetland birds. We will also deploy acoustic recording units (ARUs) at Green Heron sampling locations to better understand how these areas support other secretive wetland-dependent species that may also be in decline. We will use the results of our study to identify the habitat factors that support wetland-dependent species and develop standardized survey protocols for other secretive bird species associated with forested and brushy wetland cover types, including Belted Kingfishers (*Megasceryle alcyon*) and Yellow-billed Cuckoos (*Coccyzus americanus*), both of which are difficult to study and lack key information on their population status.

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?

We will: 1) describe the annual cycle habitat use and migratory movements of Green Herons in Minnesota, 2) quantify Green Heron habitat use and selection during the breeding season and identify post-breeding, stopover, and wintering habitats, 3) evaluate Green Heron migratory connectivity, and 4) characterize wetland-dependent bird communities using data from acoustic recordings at Green Heron sampling locations. This project will provide data to assess wetland habitats for Green Herons and other wetland-dependent birds and provide insights for conservation planning to ensure long-term sustainability of this critical habitat for Minnesota's wetland species.

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 and In the Future

Activities and Milestones

Activity 1: Field Sampling and Data Collection

Activity Budget: \$123,000

Activity Description:

To better understand Green Heron annual cycle habitat use and migration, we will: 1) identify potential study areas that are representative of Green Heron breeding sites across Minnesota by processing land cover maps to determine suitable sites to survey, 2) survey for Green Herons and capture individuals using mist nets, and deploy GPS tracking devices (n=55, including pilot tags) in 2025 and 2026 to track individuals throughout the breeding and non-breeding season, 3) deploy ARUs at each Green Heron sampling location to assess the breeding wetland-dependent bird community. These data will provide critical information that will be used to understand the ecology of Green Herons and potential causes of population declines throughout their range.

Beginning with transmitter deployment in 2025, we will acquire high-resolution location data for Green Herons breeding in Minnesota, and evaluate local and regional movements and habitat use. The GPS satellite transmitters will record and save GPS locations several times each day for two years and can record locations every 15 minutes for two years. The data are uploaded using the 4G cellular network and will be archived in Movebank, a free repository for animal location and biologging data.

Activity Milestones:

Description	Approximate Completion Date
Identify potential sampling locations across Minnesota (year 1)	May 31, 2025
Deploy ARUs at Green Heron sampling locations (year 1)	May 31, 2025
Capture Green Herons and deploy GPS tracking devices (year 1)	August 31, 2025
Identify potential sampling locations across Minnesota (year 2)	May 31, 2026
Deploy ARUs at Green Heron sampling locations (year 2)	May 31, 2026
Capture Green Herons and deploy GPS tracking devices (year 2)	August 31, 2026
Acquire high-resolution GPS data for tagged Green Heron (ongoing until project end)	May 31, 2028

Activity 2: Quantify Green Heron annual cycle habitat use, migratory movements, and connectivity; assess wetland bird community using ARU data

Activity Budget: \$301,000

Activity Description:

We will fit statistical models to the location data to describe seasonal movement and habitat-use patterns, including a comparison of the use and availability of different wetland types as an index of habitat selection or preference. We will map migration pathways and fit movement models or movement-based home range estimators (e.g., Brownian Bridges) to summarize local movement patterns. We will assess land-cover abundance and distribution using publicly available land-cover data along with high-resolution movement data derived from marked herons, to identify patterns in use of wetlands by marked birds. We will evaluate acoustic data from each sampling location to identify target vocalizations (i.e., vocalizations indicative of presence and breeding). Results from our acoustic recordings will be used to assess the relationship between wetland bird species richness and wetland characteristics from land cover data (heterogeneity, vegetation cover, height, variability, and texture). We will also develop a website to showcase Green Heron migratory movement patterns as part of our outreach and dissemination efforts. This website will be patterned after the one we developed for our LCCMR-funded study of trumpeter swans, which has been viewed over 30,000 times by ~19,000 unique viewers in 60 different countries.

Activity Milestones:

Description	Approximate Completion Date
Evaluate migratory connectivity of Green Herons breeding in Minnesota and characterize migratory behavioral patterns	August 31, 2027
Acquire habitat data from Green Heron sampling locations and across migratory routes and wintering locations	December 31, 2027
Describe annual cycle habitat use and migratory movements; summarize via project website, presentations, and publications	December 31, 2027
Quantify habitat use at breeding, post-breeding dispersal, migration and wintering areas	December 31, 2027
Characterize wetland-dependent bird communities using data from acoustic recordings at sampling locations	December 31, 2027
Summarize habitat use at breeding, dispersal, migration and wintering areas via website, presentations, and publications	June 30, 2028
Summarize migratory connectivity and behavioral patterns via project website, presentations, and publications	June 30, 2028
Summarize data from acoustic recordings via project website, presentations, and publications	June 30, 2028
Submit final LCCMR report and activity summary	June 30, 2028

Project Partners and Collaborators

Name	Organization	Role	Receiving Funds
Dr. David E. Andersen	Minnesota Cooperative Fish and Wildlife Research Unit	The Minnesota Cooperative Fish and Wildlife Research Unit will provide in-kind and other support, including purchase and loan of additional supplies (2 ARGOS GPS Solar Pinpoint Tags). Dr. Andersen will also serve as a scientific advisor to the project.	No
Dr. Michael Wells	U.S. Fish and Wildlife Service	Dr. Wells will assist with coordination of field logistics, data management and analyses, and will co-advise the graduate research assistant. Dr. Wells will also contribute in-kind support, including the purchase of 3 ARGOS GPS Solar Pinpoint Tags and an ARGOS Data Subscription for 5 tags.	No

Dissemination

Describe your plans for dissemination, presentation, documentation, or sharing of data, results, samples, physical collections, and other products and how they will follow ENRTF Acknowledgement Requirements and Guidelines.

Results of this project will provide information about Minnesota green herons that will be disseminated to state and federal management agencies and conservation-based nonprofit organizations, published in the peer-reviewed literature, included in a MS thesis, and made available to the general public via a project website, popular press articles, and presentations. Our project website will be patterned after the one we developed for our LCCMR-funded study of trumpeter swans, which has been viewed over 30,000 times by ~19,000 unique viewers in 60 different countries. Real-time movement data from marked green herons will be made available shortly after birds are captured and tagged via the Movebank website, a free, online database of animal tracking data hosted by the Max Planck Institute of Animal Behavior.

The Environment and Natural Resources Trust Fund will be acknowledged through use of the trust fund logo or attribution language on project print and electronic media, publications, signage, and other communications per the ENRTF Acknowledgment Guidelines.

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 work be funded?

This study will provide critical information needed for assessing the factors that may be driving Green Heron declines in much of their range and declines in other wetland-dependent species. Understanding whether population dynamics are driven by degradation of wetland habitats and lack of use of newly created wetlands, or factors outside of Minnesota will support wetland restoration efforts and conservation strategies that will benefit multiple migratory and wetland-dependent species during both breeding and non-breeding seasons. Information on important migration corridors and wintering areas can be used to inform conservation and habitat management decisions from the Refuge to the Flyway scale.

Other ENRTF Appropriations Awarded in the Last Six Years

Name	Appropriation	Amount Awarded
Minnesota Trumpeter Swan Migration Ecology and Conservation	M.L. 2019, First Special Session, Chp. 4, Art. 2, Sec. 2, Subd. 03d	\$300,000

Red-headed Woodpeckers as Indicators of Oak Savanna Health	M.L. 2019, First Special Session, Chp. 4, Art. 2, Sec. 2, Subd. 03j	\$171,000
Bioacoustics for Broad-Scale Species Monitoring and Conservation	M.L. 2021, First Special Session, Chp. 6, Art. 6, Sec. 2, Subd. 03n	\$305,000

Budget Summary

Category / Name	Subcategory or Type	Description	Purpose	Gen. Ineligible	% Benefits	# FTE	Classified Staff?	\$ Amount
Personnel								
Principle Investigator		Responsible for overall project management and supervision of graduate research assistant.			37.1%	0.58		\$57,715
Co-Principle Investigator		Assists with data management and analyses to achieve project activities. Co-advises graduate student researcher.			37.1%	0.36		\$43,395
Graduate Student Researcher		Responsible for field work, data management, and analyses required to achieve project activities. One 75% GRA for 2.5 years.			48%	1.88		\$227,533
Undergraduate Student - Field Technician		Assist with field work, data collection, data entry and management.			0%	0.2		\$7,220
							Sub Total	\$335,863
Contracts and Services								
							Sub Total	-
Equipment, Tools, and Supplies								
	Tools and Supplies	Ornitrack-3 GPS-GSM tags	GPS tags collect and store location information for individually marked birds (25 tags/year @\$1300/tag x 2 years)					\$65,000
	Tools and Supplies	GSM (cellular) Data Subscription	Required to upload GPS location data. \$.02 per tag per day x 50 tags x 3 years					\$1,095
	Tools and Supplies	Bird capture equipment	Mist nets and associated supplies to capture birds at wetland sites (\$100/net x 10 nets), safety goggles (\$20/pair x 4 pairs), waders (\$150/pair of waders x 2 pairs)					\$1,380
	Tools and Supplies	ARU Kits: Acoustic Recording Units and associated supplies: batteries, SD cards	ARUs will be used to collect audio data at Green Heron sampling locations (49 ARUs, batteries, and SD cards @ \$145/kit).					\$7,105

							Sub Total	\$74,580
Capital Expenditures								
							Sub Total	-
Acquisitions and Stewardship								
							Sub Total	-
Travel In Minnesota								
	Miles/ Meals/ Lodging	Lodging: \$107/night/person x 2 nights/location x 7 locations/year x 2 years x 2 persons	Lodging for graduate student and field technician conducting field work					\$5,992
	Miles/ Meals/ Lodging	Meals: (\$59/full day + (\$44.25/partial day x 2 partial days) x 2 people) x 7 trips	Meal reimbursement for graduate student and field technician conducting field work					\$2,065
	Miles/ Meals/ Lodging	\$0.67/mile x 2238 miles/year x 2 years	Mileage for one vehicle for each of two field seasons					\$3,000
							Sub Total	\$11,057
Travel Outside Minnesota								
							Sub Total	-
Printing and Publication								
	Publication	We plan to publish 2 papers based on research from this project (December 2027 and July 2028 upon completion of field work and data analysis).	Publishing peer reviewed papers					\$2,500
							Sub Total	\$2,500
Other Expenses								
							Sub Total	-
							Grand Total	\$424,000

Classified Staff or Generally Ineligible Expenses

Category/Name	Subcategory or Type	Description	Justification Ineligible Expense or Classified Staff Request
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Non ENRTF Funds

Category	Specific Source	Use	Status	\$ Amount
State				
In-Kind	Minnesota Cooperative Fish and Wildlife Research Unit, University of Minnesota	Purchase of 2 ARGOS GPS Solar Pinpoint Tags	Secured	\$4,200
Cash	Dr. Elena West startup funds (University of Minnesota)	Salary support for part-time UMN undergraduate summer research technician (year 1, 2025)	Secured	\$4,200
Cash	Dr. Elena West startup funds (University of Minnesota)	Vehicle rental for scouting and ARU deployments prior to July 1, 2025 project start date	Secured	\$2,000
In-Kind	Dr. Elena West Lab supplies	20 ARU kits to be deployed in May 2025 prior to initiation of the ENTRF-funded portion of this project (ARUs will be used to collect audio data at Green Heron sampling locations: ARUs, batteries, and SD cards @ \$145/kit).	Secured	\$2,900
			State Sub Total	\$13,300
Non-State				
In-Kind	U.S. Fish and Wildlife Service	Purchase of 3 ARGOS GPS Solar Pinpoint Tags and ARGOS Data Subscription for 5 tags	Secured	\$14,100
In-Kind	U.S. Fish and Wildlife Service	Salary of USFWS Biologist (1 month salary/year x 3 years)	Secured	\$30,000
			Non State Sub Total	\$44,100
			Funds Total	\$57,400

Total Project Cost: \$481,400

This amount accurately reflects total project cost?

Yes

Attachments

Required Attachments

Visual Component

File: [12d2442e-ad5.pdf](#)

Alternate Text for Visual Component

The problem we seek to address: Green Herons have declined across much of their range yet information on their annual cycle habitat use and migratory movements is needed to understand and address conservation concerns for wetland-dependent birds....

Supplemental Attachments

Capital Project Questionnaire, Budget Supplements, Support Letter, Photos, Media, Other

Title	File
UMN Board of Regents Endorsement Letter	5e98d4c0-c84.pdf
2025-127 Research Addendum_revised Final	366d8a7e-d37.pdf

Difference between Proposal and Work Plan

Describe changes from Proposal to Work Plan Stage

We have made the following edits in response to comments from LCCMR (5/28/25):

- 1) revised the Narrative page to address peer review revisions requested.
- 2) revised the project milestones to more clearly indicate products and deliverables as they relate to the outcomes we identified on the Narrative page.

We have made the following edits in response to comments from LCCMR (5/16/25):

- 1) revised the project outcomes to more clearly articulate how we will demonstrate that our outcomes have been achieved at the end of this project;
- 2) removed from the narrative page language around testing competing hypotheses (which we removed from our research addendum);
- 3) added to the narrative page new aspects from our research addendum related to filling gaps in our understanding of this species' breeding, wintering, and migratory habits and co-occurrence patterns with other wetland-dependent species in MN;
- 4) changed Activity 1 to reflect changes made in our research addendum related to the type of tracking devices to be used and cellular vs satellite transmission;
- 5) revised the budget to be consistent with changes made to the budget in the research addendum (increased cost and type of GPS tags, decreased cost for data subscription);
- 6) added the in-kind support and other budget line items related to acoustic recorders to the non-ENTRF subtab of our budget, as we indicated to reviewers and mentioned in an email to Becca Nash on 11/25/24.

We added milestones to the budget line item for publications to address the comment related to that item.

Additional Acknowledgements and Conditions:

The following are acknowledgements and conditions beyond those already included in the above workplan:

Do you understand and acknowledge the ENRTF repayment requirements if the use of capital equipment changes?

N/A

Do you understand that travel expenses are only approved if they follow the "Commissioner's Plan" promulgated by the Commissioner of Management of Budget or, for University of Minnesota projects, the University of Minnesota plan?

Yes, I understand the UMN Policy on travel applies.

Does your project have potential for royalties, copyrights, patents, sale of products and assets, or revenue generation?

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?

Yes, Sponsored Projects Administration

Does your project include the pre-design, design, construction, or renovation of a building, trail, campground, or other fixed capital asset costing \$10,000 or more or large-scale stream or wetland restoration?

No

Do you propose using an appropriation from the Environment and Natural Resources Trust Fund to conduct a project that provides children's services (as defined in Minnesota Statutes section 299C.61 Subd.7 as "the provision of care, treatment, education, training, instruction, or recreation to children")?

No

Provide the name(s) and organization(s) of additional individuals assisting in the completion of this project:

Dr. John Fieberg, Dr. David Andersen, Dr. Michael Wells

Do you understand that a named service contract does not constitute a funder-designated subrecipient or approval of a sole-source contract? In other words, a service contract entity is only approved if it has been selected according to the contracting rules identified in state law and policy for organizations that receive ENRTF funds through direct appropriations, or in the DNR's reimbursement manual for non-state organizations. These rules may include competitive bidding and prevailing wage requirements

N/A