Environment and Natural Resources Trust Fund

M.L. 2024 Approved Work Plan

General Information

ID Number: 2024-296

Staff Lead: Lisa Bigaouette

Date this document submitted to LCCMR: June 8, 2024

Project Title: Integrated Population Modeling for Trumpeter Swans

Project Budget: $180,000

Project Manager Information

Name: Todd Arnold

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Project Reporting

Date Work Plan Approved by LCCMR: June 20, 2024

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

Project Completion: December 31, 2026

Final Report Due Date: February 14, 2027

Legal Information

Legal Citation: M.L. 2024, Chp. 83, Sec. 2, Subd. 03bb

Appropriation Language: $180,000 the second year is from the trust fund to the Board of Regents of the University of Minnesota to compile and use all available data to model historical population abundance and estimate future population dynamics of Minnesota trumpeter swans.

Appropriation End Date: June 30, 2027

Narrative

Project Summary: We will compile all available data for Minnesota Trumpeter Swans and use these sources to model historical population abundance and predict future population dynamics.

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

Trumpeter swans are a large, charismatic waterfowl species that are highly valued by Minnesotans. Extirpated from Minnesota, then reintroduced using special taxpayer-funded efforts, Trumpeter Swans are now relatively common and breed throughout Minnesota, though they are still considered a species of special concern by MN DNR.

Insufficient resources have been allocated to survey and monitor the growth and population trajectory of Trumpeter Swans in Minnesota. Population indices from auxiliary waterfowl surveys suggest abundance is rapidly growing, but incomplete spatial coverage prevents these estimates from representing an accurate count of Trumpeter Swans in Minnesota. Other swan-specific surveys were historically conducted by USFWS every 5 years, but have been discontinued.

As well as abundance, an understanding of population dynamics are necessary for best conservation practices. Managers do not currently have reliable estimates of the current rate of Trumpeter Swan population growth, whether it is approaching a plateau in the near future, and which vital rates (e.g., survival, fecundity) are most important to population dynamics. We also do not have the ability to forecast population conditions in the future to predict population trajectory over time. These info gaps preclude the ability to set the most informed conservation policies for Trumpeter Swans in

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.

We will construct an integrated population model (IPM) to provide a unified statistical framework for concurrently analyzing all available datasets for Trumpeter Swan populations in Minnesota. The IPM will use historical and current data sources to estimate population abundance, survival and fecundity rates, and relative contribution of survival and fecundity to overall population dynamics. Analyzing multiple datasets with IPMs can improve estimates of population abundance and growth, and also provide information on the most important vital rates for managers to focus on in order to better conserve Trumpeter Swan populations within Minnesota. Integrated population models have been used to successfully guide wildlife management plans for a variety of species, including Trumpeter Swans in Iowa.

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?

Our project fills a critical gap in the knowledge of Trumpeter Swans in Minnesota, a species that has shifted from rare to relatively common in the last 20 years. Will population growth slow now that they are more widespread and abundant, or will their population continue to grow exponentially until swan numbers in Minnesota are comparable to species such as Giant Canada Geese, a species so abundant it's considered a 'nuisance' in some situations? Model results will provide reliable estimates of population abundance and allow prediction of population trajectories into the future, including the ability to estimate potential carrying capacity.

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: Data Acquisition

Activity Budget: $24,020

Activity Description:
We will acquire all relevant datasets that provide information on trumpeter swans (i.e., banding, resighting, survival, and abundance) from a variety of agencies, filter out data errors, and build a database suitable for statistical analysis.

Activity Milestones:

Description	Approximate Completion Date
1. Acquire banding, resighting, and recovery data from US Geological Survey Bird Banding Lab.	April 30, 2025
Acquire survey data from MN DNR, USGS Breeding Bird Survey, and eBird.	April 30, 2025

Activity 2: Develop and test the integrated population model

Activity Budget: $45,681

Activity Description:
Using the acquired datasets, we will build each sub-model component that will make up the IPM (i.e. models of population abundance, annual fecundity, and annual survival). We will fit a Bayesian state-space model to all historical survey data (MN DNR annual waterfowl surveys and 5-yr USFWS swan surveys) to produce more precise estimates of annual abundance. We will use banding and encounter data from 1970-present, as well as telemetry data from an ongoing LCCMR project (Trumpeter Swan Migration Ecology and Conservation), to estimate annual survival rates. We will use nest-monitoring data from Minnesota and Iowa to estimate annual fecundity rates.

Activity Milestones:

Description	Approximate Completion Date
Estimate population counts from the multiple survey datasets	September 30, 2025
Estimate annual survival rates from telemetry data and USGS BBL data	September 30, 2025
Estimate annual fecundity rates from MN nest monitoring and other studies	September 30, 2025

Activity 3: Develop and test the integrated population model

Activity Budget: $110,299

Activity Description:
We will combine demographic rates from the sub-model components into a mechanistic analytical framework using a Bayesian age/stage-structured model. The model will allow us to use data from individual Trumpeter Swans to create population-level inference about which factors have contributed most strongly to historical population growth. We can then use this model to make predictions about future population growth under different management frameworks.

Activity Milestones:

Description	Approximate Completion Date
Develop integrated population model combining count, survival, and fecundity data	May 31, 2026
Conduct simulations to verify model predictions and test performance	July 31, 2026
Prepare final report; disseminate formal results to managers and general public	December 31, 2026

Project Partners and Collaborators

Name	Organization	Role	Receiving Funds
David Wolfson	University of Minnesota	Post-Doc	Yes
Steve Cordts	Minnesota Department of Natural Resources	Support with data acquisition and waterfowl population ecology.	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.
We will take several steps to insure that results from our work are available to assist with conservation and management efforts for Trumpeter Swans in Minnesota. The first step will involve presenting our results at the annual meeting of the Minnesota Chapter of The Wildlife Society, which routinely attracts working professionals from state, federal, university, and NGO organizations from throughout Minnesota. In addition, we will give presentations or overviews to any agencies or NGOs that are interested in our work (e.g. MN DNR, Trumpeter Swan Society). We will coordinate with other UMN projects working with tribal entities to explore concerns relating to swan depredation of wild rice crops on reservation and treaty areas. We will utilize the UMN Library's Data Preservation (DRUM) services to archive all data and computer code from our project so that everything is freely available online in open access format. Finally, we will publish our work in a scientific journal using open access format so that our work is freely available online. Regardless of the dissemination media, we will be sure to acknowledge the Environment and Natural Resources Trust Fund in all of our project communications - for public presentations that will include both logo and text, and for written communications it will include a text references.

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 project represents a needed tool for stakeholders to have accurate information on Trumpeter Swan populations in Minnesota. Wildlife biologists at the MN DNR will be able to use this IPM to better monitor Trumpeter Swans in Minnesota without a big investment across the state in expensive aerial surveys and banding efforts. Additionally, any efforts that are taken in the future to monitor Trumpeter Swans will be able to feed directly into the IPM framework, thus improving model performance going forward.

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

Budget Summary

Category / Name	Subcategory or Type	Description	Purpose	Gen. Ineligible	% Benefits	# FTE	Classified Staff?	$ Amount
Personnel								
Principle Investigator		Oversee project and mentor post-doc			36.8%	0.16		$31,311
Post-doc		Summarize data, conducts analysis, prepares papers and final reports. Disseminates research through publications and professional presentations..			25.7%	2		$144,121
							Sub Total	**$175,432**
Contracts and Services								
							Sub Total	**-**
Equipment, Tools, and Supplies								
							Sub Total	**-**
Capital Expenditures								
							Sub Total	**-**
Acquisitions and Stewardship								
							Sub Total	**-**
Travel In Minnesota								
	Conference Registration Miles/ Meals/ Lodging	Conference registration: $500 Mileage: 642 miles @ $0.655/mi = $420.50 Lodging: 3 nights @ 147/night = $441 Meal per diem: $44.25/ first & last, $59/day (44.25 +59+59+44.25)= $206.50	We will present research findings at the MN TWS Annual Meeting					$1,568
							Sub Total	**$1,568**
Travel Outside Minnesota								

							Sub Total	**-**
Printing and Publication								
	Publication	1 open-access journal article publication	Disseminate research findings to the professional community					$3,000
							Sub Total	**$3,000**
Other Expenses								
							Sub Total	**-**
							Grand Total	**$180,000**

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				
			State Sub Total	**-**
Non-State				
			Non State Sub Total	**-**
			Funds Total	**-**

Attachments

Required Attachments

Visual Component

File: 674c8b0a-bc2.pdf

Alternate Text for Visual Component

This visual component displays the problem, solution, and project outcome, as well as a visual representation of the analytical workflow...

Supplemental Attachments

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

Title	File
SPA Approval letter	8d6352ab-fa1.pdf
Approved Research Addendum	1198f5ad-d0d.pdf

Difference between Proposal and Work Plan

Describe changes from Proposal to Work Plan Stage

No changes have been made to date. We will reassess activities 2 and 3 after completing activity 1, if we note any data deficiencies (or identify any new sources of data) that might require us to alter our original workplan.

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 agree travel expenses must 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 agree to the UMN Policy.

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?

No

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