



# Environment and Natural Resources Trust Fund

M.L. 2023 Approved Work Plan

## General Information

**ID Number:** 2023-010

**Staff Lead:** Michael Varien

**Date this document submitted to LCCMR:** May 22, 2023

**Project Title:** Karner Blue Butterfly Insurance Population Establishment in Minnesota

**Project Budget:** \$405,000

## Project Manager Information

**Name:** John Moriarty

**Organization:** Three Rivers Park District

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## Project Reporting

**Date Work Plan Approved by LCCMR:** June 22, 2023

**Reporting Schedule:** April 1 / October 1 of each year.

**Project Completion:** June 30, 2026

**Final Report Due Date:** August 14, 2026

## Legal Information

**Legal Citation:** M.L. 2023, Chp. 60, Art. 2, Sec. 2, Subd. 08b

**Appropriation Language:** \$405,000 the first year is from the trust fund to the commissioner of natural resources for an agreement with the Three Rivers Park District to establish a breeding population of the federally endangered Karner blue butterfly on protected lands within the butterfly's northern expanding range, increase the habitat area, and evaluate the butterfly establishment effort to assist with adaptive management. This appropriation is available until June 30, 2027, by which time the project must be completed and final products delivered.

**Appropriation End Date:** June 30, 2027



## Narrative

**Project Summary:** To establish a breeding insurance population of Karner Blue Butterflies for climate mitigation in a restored prairie/savanna at Crow-Hassan Park and assess the quality of habitat on butterfly populations.

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

The Karner Blue Butterfly is a federally endangered butterfly that is a flagship conservation species for endangered oak-savanna ecosystem. Although Karner Blues have a foothold in regions to the east, they are threatened by shifts in climate that may make these areas unsuitable in the future. A recent U of MN model showed optimal habitat will shift north and west, centering on East-Central Minnesota. The present work will establish a climate insurance population of Karner Blues at a site within this new optimal habitat range. Karner Blues were native to several locations in Minnesota but have not been found in the state since 2010. Cedar Creek Ecosystem Science Reserve was one of the known populations and is located only 25 miles from Crow-Hassan, a 1200-acre recreated prairie/savanna system in NW Hennepin County. This prairie includes a high population of wild lupine, which is the required food plant for KBB caterpillars. The site is away from agricultural lands and associated pesticide drift and is continuing to expand its savanna habitat. This work is being conducted in partnership with USFWS, U of MN, and USGS with consultation of the MNDNR. The resulting climate insurance population will be available to other locations

**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 proposal will collect 200 to 500 adult Karner Blues from Fort McCoy Army Base in Wisconsin under a USFWS and MNDNR endangered species permits (applications in process). Fort McCoy has one the largest known Karner Blue populations and is willing to provide adult Karner Blues for this effort. Collected butterflies will be transported to Crow-Hassan's recreated prairie/savanna complex and released at several subsites where egg laying and survival will be monitored. Released Karner Blues will be monitored for 3 years to make sure there is establishment and spread. The release will also be used to address two critical research questions about Karner Blue biology and establishment success – why and how shade on the savannah affects butterfly survival. First, we will address the hypothesis that shade affects the nutritional quality of wild lupine host plants. Second, we will structure the release in different shade microhabitats to test the role of temperature and humidity on egg and caterpillar survival. The research results will help adapt habitat management and release methods for Karner Blue success at this site and elsewhere. This project will also increase the savanna habitat across the Crow-Hassan system by thinning woodlands and planting oaks into the prairie.

**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?**

The outcome of this proposal will be an insurance population of Karner Blues in the state that could be used to provide butterflies for other potential introductions in appropriate habitats, including Sherburne NWR and Cedar Creek ESR. This population will assist in climate change migration, or adaptive management. Populations in the southern portion of their range (Indiana) have been lost to climate changes. The techniques developed and information gathered for this project will be shared with other Karner Blue restoration efforts through a handbook and peer-reviewed publications. Results will be shared at conferences, working groups, and public webinars on butterfly.

## Project Location

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

Region(s): Metro

**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: Increase Savanna habitat and shade grown lupine in the Crow-Hassan complex

**Activity Budget:** \$158,000

**Activity Description:**

Karner Blue butterflies depend on oak-savannah habitat, but intact oak-savannah ecosystems are some of the rarest plant communities today. Three Rivers will expand the savanna habitat on the western and southern portions of the Crow-Hassan prairie to make a larger habitat for Karner Blues to accommodate a growing population over time. Savanna habitat will be expanded into 30 acres of buffer woods by thinning of non-oak species and increasing fire rotations and into existing prairies by installing 50 large oaks by tree spade. These areas will be additionally supplemented with plant species on which Karner Blues depend. The enhanced areas will receive additional lupine seed and plants (the host plant of Karner Blue caterpillars). The lupine populations across the prairie will be mapped using the Dept of Defense protocols. A map of the enhancement areas is attached.

**Activity Milestones:**

Description	Approximate Completion Date
Overseeding of Lupine into enhanced areas and around trees - phase 1	August 31, 2023
develop and issue RFP for restoration and tree planting	August 31, 2024
Planting Oaks	May 31, 2025
Overseeding of Lupine into enhanced areas and around trees - phase 2	August 31, 2025
Thinning of Woodlands	December 31, 2025
Confirm tree planting and restoration work completion	April 30, 2026

### Activity 2: Capture and relocation of Karner Blues from Fort McCoy to Crow-Hassan

**Activity Budget:** \$6,000

**Activity Description:**

Fort McCoy is a 90 square mile site 150 miles from the Twin Cities that contains extensive savannah habitat and a healthy population of over 6000 Karner Blue butterflies. A collection group made up of project staff, TRPD staff and partners will travel to Fort McCoy during the first flight period in June 2024. The exact date will be determined by the Fort McCoy endangered species officer. The Karner Blues will be collected in pairs and transported at the end of each day to Crow-Hassan for release. 4 days are planned for collecting and will stop when 500 adult Karner Blues are collected. Transport of the butterflies will be done under USFWS, WIDNR, and MNDNR permits. Transport containers will be finalized with consultation from the MNZOO butterfly biologists and KBB recovery team members. A portion of the butterflies will be released into temporary screen tents to manage egg laying (see Activity 3).

**Activity Milestones:**

Description	Approximate Completion Date
Capture and Release KBB	June 30, 2024
Second Flight period survey to confirm establishment	August 31, 2024
Conduct second Capture and Release if needed	June 30, 2025

### Activity 3: Evaluation of lupine nutrition for Karner Blues

**Activity Budget:** \$44,000

**Activity Description:**

The monitoring around the Karner Blue release will be structured in a way to address two critical questions that affect butterfly success across their range. Across a range of studies and release efforts, biologists have found that Karner Blues rely on shade for establishment success – females often prefer to lay eggs on lupines in partial shade, but caterpillars tend to thrive in somewhat denser shade. This is thought to be due to lupine drying out in full sunlight, but the true drivers are unknown. This activity will address the hypothesis that shade affects lupine nutrition and water content, with likely effects on caterpillar growth (see Activity 4). During the summer of 2023, we will harvest lupine leaves to measure the content of key macronutrients (carbon, nitrogen, phosphorus), micronutrients (potassium, sodium, iron), and water content. We will contrast both new and old leaf growth, early and late in the season as plant nitrogen content varies with leaf age and season. Samples will be taken along a gradient of <10% to 100% shade as plant leaf physiology shifts in the shade. These data will be broadly relevant to improving future reintroduction efforts across the eastern United States.

**Activity Milestones:**

Description	Approximate Completion Date
Pilot sampling of plants for nutrition analysis	December 31, 2023
Sampling of plants in experimental plots	December 31, 2024
Additional plant sampling	December 31, 2025
Plant analysis of nutrient levels	February 28, 2026
Analysis and writing of scientific manuscript	June 30, 2026

## Activity 4: Evaluation of Karner Blue caterpillar growth, microhabitat suitability and population establishment

**Activity Budget:** \$196,000

**Activity Description:**

Activity 4 will evaluate the establishment of the KBB population at Crow-Hassan, using egg, caterpillar and adult surveys. To monitor larval growth, we will first release Fort McCoy-collected butterflies in large flight cages for 24 hours at a time to concentrate eggs on known patches of lupine. Will monitor larval growth and survival by checking plants for larvae daily. This approach will also allow tests of the hypothesis that shade affects larval survival by buffering temperature and humidity extremes. Eggs will be concentrated in replicate blocks within each of four microsites that vary in the presence of shade to the north or south. Within each block, we will erect a 15 cm x 1 m shade cloth 1-m off the ground as an additional shade manipulation. We will monitor temperature, and humidity within each microhabitat using small sensors, and test for correlations with caterpillar performance.

To monitor adult KBBs, we will use straight-line transects, which can correct for differences in detectability of these very small butterflies across sites. We will perform transect surveys every week during the May-August flight period of the KBB (peaking late May/early June and late July), during the year of release and the year

**Activity Milestones:**

Description	Approximate Completion Date
Experimental design and field setup	April 30, 2024
Egg, larval, temperature monitoring during release	July 31, 2024
estimate of survival in later release flights	September 30, 2024
Data analysis	June 30, 2025
Writing and publication of findings in peer-reviewed manuscripts	June 30, 2026

## Activity 5: Develop a Karner Blue introduction handbook

**Activity Budget:** \$1,000

### Activity Description:

The techniques developed for this project will be useful for improving on existing techniques and contributing to the successful introduction of Karner Blues into other sites. A handbook of how to collect, transport and monitor the butterflies will provide a template for future activities and assist conservationists in generating a strong foundation on their projects. The handbook will also include BMPs for habitat management and enhancements. This handbook will be developed as an electronic document and distributed as a pdf. Other areas of the project covering lupine nutrition and caterpillar growth will be published in appropriate peer-reviewed scientific journals as mentioned in activities 3 and 4.

### Activity Milestones:

Description	Approximate Completion Date
Data collection and reference review	September 30, 2025
Write Text and gather figures- review and revise	February 28, 2026
Distribute document	June 30, 2026

## Project Partners and Collaborators

Name	Organization	Role	Receiving Funds
Angela Grill	Three Rivers Park District	Lead Field Person for TRPD. Involved with lupine surveys, tree planting, KBB capture and reporting	No
Emilie Snell-Rood, PhD	University of Minnesota	Co-Investigator leading the U of MN monitoring lupine research crew on field work and assisting with KBB collection and coordinating KBB studies (see attachment for qualifications and organization description)	Yes
Jessica Hellman, PhD	University of Minnesota	Project consultant on climate change effects on KBB.	No
TBD - Post Doc	University of Minnesota	Field investigator on caterpillar preference on Lupine and survival strategies. Assist with KBB capture and monitoring	Yes
TBD - Student Worker	University of Minnesota	Assist with research and monitoring	Yes
Jill Utrup	US Fish and Wildlife Service	Provide federal support on permitting and KBB transfer	No
Jessup Weichelt	Dept. of Defense - Fort McCoy	Site manager for butterfly collection	No
Anna Hess, PhD	USGS - Upper Midwest Environmental Sciences Center	Consultant - All things KBB	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 be:

- publishing the results of the lupine and growth research in peer-reviewed scientific journals to get the information to researchers and agencies studying KBB.
- developing a handbook on restoration and management techniques to share with land managers and agencies wanting to increase their KBB habitat and expand their range.
- developing public programs on the restoration project to share with the public and policy makers on the importance habitat restoration and the work needed to provide proper habitats for KBB and other rare species. These programs will be shared with other agencies and organizations.
- acknowledging the Environment and Natural Resources Trust Fund use of the trust fund logo or attribution language on project print and electronic media, project web pages, 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?**

The results of this study will assist in future management and monitoring plans and strategies at the Three Rivers Park District and the efforts of current and future Karner Blue land managers and researchers. Data, observations, expert feedback and newly developed techniques gathered at Three Rivers will be analyzed, compiled and distributed to the



public, land managers and researchers, and incorporated into existing and future management plans. The long term management and monitoring will be incorporated into Three Rivers Park District's Wildlife operation budget. Habitat management will be ongoing to maintain habitat quality. Monitoring of populations will occur every summer.

## Budget Summary

Category / Name	Subcategory or Type	Description	Purpose	Gen. Ineligible	% Benefits	# FTE	Classified Staff?	\$ Amount
<b>Personnel</b>								
							<b>Sub Total</b>	-
<b>Contracts and Services</b>								
Univ of Minnesota	Sub award	Personnel, supplies and lab fees				6		\$241,000
Prairie Restorations or Similar	Professional or Technical Service Contract	Forestry Thinning including tree girdling, mowing, overseeding for 50 acres to expand and enhance savanna habitat for KBB introduction				0		\$125,000
							<b>Sub Total</b>	<b>\$366,000</b>
<b>Equipment, Tools, and Supplies</b>								
	Equipment	Screen cages (20) and Screen Tents (4) and associated materials	For the transportation and release of the KBB from Fort McCoy to Crow-Hassan					\$2,000
	Tools and Supplies	purchase and installation of 50 - 3" to 5" bur oaks	Part of the savanna restoration and enhancement for the KBB introduction					\$33,000
							<b>Sub Total</b>	<b>\$35,000</b>
<b>Capital Expenditures</b>								
							<b>Sub Total</b>	-
<b>Acquisitions and Stewardship</b>								
							<b>Sub Total</b>	-
<b>Travel In Minnesota</b>								
							<b>Sub Total</b>	-

<b>Travel Outside Minnesota</b>								
	Miles/ Meals/ Lodging	2 Trips, no mileage - TRPD vehicles, 10 people for 2 days per trip	This is for the capture crew to travel to Fort McCoy in Wisconsin to collect KBB. There are no populations of this butterfly in MN. This is the largest known population that can donate the needed number of butterflies	X				\$4,000
							<b>Sub Total</b>	<b>\$4,000</b>
<b>Printing and Publication</b>								
							<b>Sub Total</b>	-
<b>Other Expenses</b>								
							<b>Sub Total</b>	-
							<b>Grand Total</b>	<b>\$405,000</b>

## Classified Staff or Generally Ineligible Expenses

Category/Name	Subcategory or Type	Description	Justification Ineligible Expense or Classified Staff Request
<b>Travel Outside Minnesota</b>	Miles/Meals/Lodging	2 Trips, no mileage - TRPD vehicles, 10 people for 2 days per trip	There are no known populations of KBB in Minnesota. Fort McCoy is the closest population large enough to provide the butterflies. The travel request covers food and lodging. Vehicles and mileage are covered in-kind by TRPD in-kind

## Non ENRTF Funds

Category	Specific Source	Use	Status	\$ Amount
<b>State</b>				
			<b>State Sub Total</b>	-
<b>Non-State</b>				
In-Kind	TRPD operational funds	Cover the salaries of TRPD staff, vehicle, and other equipment use associated with the grant	Secured	\$229,000
In-Kind	Anna Hess - USGS research	Project collaborator on lupine and butterfly work for three years 10% of time	Secured	\$45,000
In-Kind	University of MN	Univ of Minnesota overhead	Secured	\$132,000
In-Kind	Univ of MN	faculty support and consultation - see research addendum	Secured	\$50,000
			<b>Non State Sub Total</b>	<b>\$456,000</b>
			<b>Funds Total</b>	<b>\$456,000</b>

# Acquisition and Restoration

## Parcel List

Name	County	Site Significance	Activity	Acres	Miles	Estimated Cost	Type of Landowner	Easement or Title Holder	Status of Work
Crow-Hassan Prairie	Hennepin	prairie and savanna	Restoration	50	-	\$158,000	Public		Has Not Begun
<b>Totals</b>				<b>50</b>	<b>0</b>	<b>\$158,000</b>			

## Restoration

**1. Provide a statement confirming that all restoration activities completed with these funds will occur on land permanently protected by a conservation easement or public ownership.**

The restoration activities in this grant will all occur within Crow-Hassan Park Reserve which is part of the Three Rivers Park District.

**2. Summarize the components and expected outcomes of restoration and management plans for the parcels to be restored by your organization, how these plans are kept on file by your organization, and overall strategies for long-term plan implementation.**

The components include opening up woodlands by forestry mowing to create savanna conditions and the planting of oak trees in existing prairie to bring savanna conditions into the prairie. The mowed and planted sites will be added into our prairie management geodatabase and updated in our prescribed burn system. Three Rivers has a long term history of management in this park and the restored areas will be added to our current management plan.

**3. Describe how restoration efforts will utilize and follow the Board of Soil and Water Resources “Native Vegetation Establishment and Enhancement Guidelines” in order to ensure ecological integrity and pollinator enhancement.**

The sites that will be part of the restoration are already in native habitat. The work being done will add increased light conditions to the woodlands and decreased light conditions to the prairies. This will increase the complexity of the prairie allowing for a wide variety of pollinators, especially Karner Blues to use the improved microhabitats and climates created by the changes in light levels and shading

**4. Describe how the long-term maintenance and management needs of the parcel being restored with these funds will be met and financed into the future.**

The parcels being restored will be added to the Three Rivers prairie management program that is funded through their operations budget

**5. Describe how consideration will be given to contracting with Conservation Corps of Minnesota for any restoration activities.**

We will notify CCM of the project and provide them with an opportunity to let us know if they are interested in the project. The work proposed is outside of normal CCM activities

**6. Provide a statement indicating that evaluations will be completed on parcels where activities were implemented both 1) initially after activity completion and 2) three years later as a follow-up. Evaluations should analyze improvements to the parcel and whether goals have been met, identify any problems with the implementation, and identify any findings that can be used to improve implementation of future restoration efforts at the site or elsewhere.**

The restoration activities will be evaluated upon completion to measure the differences in light levels from prior to the work. The survival of the planted trees will be assessed for the first 3 years after planting. Light levels will be reassessed 3 years after establishment to see if the initial levels have been maintained.

## Attachments

### Required Attachments

#### *Map*

File: [fa9045ed-0f7.pdf](#)

#### *Alternate Text for Map*

Map of Crow-Hassan showing the release area and the habitat enhancement project areas...

#### *Board Resolution or Letter*

Title	File
Three Rivers signed resolution	<a href="#">4ba1c631-1c9.pdf</a>

### Optional Attachments

#### *Support Letter, Photos, Media, Other*

Title	File
Snell-Rood UMN manager and organizer	<a href="#">441fd091-dbe.docx</a>
Background Check	<a href="#">f3496167-4f1.pdf</a>
Karner Blue research addendum	<a href="#">b8b6e4e8-253.pdf</a>
Revised research addendum post review	<a href="#">a3a64b97-165.pdf</a>

## Difference between Proposal and Work Plan

### *Describe changes from Proposal to Work Plan Stage*

We reviewed the milestones and added where needed

Moved the savanna work to section 8 and budget items to contracts and to supplies

Added a justification to outstate travel



## 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 Commissioner's Plan.

**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