M.L. 2019, First Special Session, Chp. 4, Art. 2, Sec. 2, Subd. 08a, as extended by M.L. 2022, Chp. 94, Sec. 2, Subd. 19 [to June 30, 2024] **Project Abstract**
For the Period Ending June 30, 2024

PROJECT TITLE: Saving Endangered Pollinators through Data-driven Prairie Restoration
PROJECT MANAGER: Dr. Erik Runquist
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FUNDING SOURCE: Environment and Natural Resources Trust Fund
LEGAL CITATION: M.L. 2019, First Special Session, Chp. 4, Art. 2, Sec. 2, Subd. 08a, as extended by M.L. 2022, Chp. 94, Sec. 2, Subd. 19 [to June 30, 2024]

APPROPRIATION AMOUNT: $800,000
AMOUNT SPENT: $798,575
AMOUNT REMAINING: $1,425

Sound bite of Project Outcomes and Results

We have advanced conservation of the Dakota skipper with an intensive propagation and reintroduction program, enhanced hundreds of acres of habitat that they and other prairie wildlife depend upon, and provided key insights into the stressors on their populations and environmental factors that are needed to support their recovery.

Overall Project Outcome and Results

Recovery of Endangered butterflies requires the protection and proper management of their habitats, but also the re-establishment of lost populations. We sought to improve our understanding the factors that drive population persistence and the tactics needed to achieve it. We have combined management and floral enhancement of hundreds of acres of prairie with multiple years of intensive reintroductions of the Dakota skipper (US Threatened, MN Endangered). Minnesota Zoo scientists reared and released thousands of individuals over the course of this project at multiple Minnesota preserves and precisely tracked their movements. Reintroductions were challenged by multiple years of extreme weather, but positive signs have been observed.

Prairies, especially the few remaining historic remnants, must be protected. Their management must also be done in a manner that fosters diversity. Dakota skippers and many other prairie butterflies not only require specific conditions but usually lack the ability to re-colonize prairies without help across a fragmented landscape. Management to maintain optimal ecological conditions can employ a diversity of tools (including potentially fire, grazing, haying, spot treatments), but such management needs to follow detailed patchwork, rotational plans to avoid causing local extirpations. We have documented that Dakota skippers in Minnesota are reliant on upland gravel prairies with high concentrations of their strongly-preferred nectar source (narrow-leaved coneflower), and that invasive grasses (particularly smooth brome) are major threats by choking out native vegetation and serving as ecological traps to their grass-feeding larvae. Beyond these prairie remnant islands, we need to understand and potentially mediate external stressors from surrounding landscapes. For example, we have published foundational data on the near universal presence of dozens of non-target pesticides in these and other prairie remnants designated as Critical Habitat for these federally-listed butterflies. Creating and enhancing quality habitat for Dakota skippers will also support other declining grassland-dependent wildlife and game.

Project Results Use and Dissemination

The information that we have generated (and will continue to generate) will be shared with other researchers, land managers, conservation practitioners, and policy agencies, and included in federal and state endangered species databases. We have published results from a foundational pesticides exposure study partially supported by this project and will submit additional findings for peer-reviewed scientific publication. The project has been highlighted in numerous news stories (like this live story at sunrise) and in a terrific video produced by the Minnesota DNR, and we shared this project through social media channels and at multiple outreach events.

Environment and Natural Resources Trust Fund (ENRTF)
M.L. 2019 ENRTF Work Plan Final Report (Main Document)

Today's Date: August 15, 2024

Date of Next Status Update Report: Final Report

Date of Work Plan Approval: June 5, 2019

Project Completion Date: June 30, 2024

PROJECT TITLE: Saving Endangered Pollinators through Data-driven Prairie Restoration

Project Manager: Dr. Erik Runquist

Organization: Minnesota Zoo

College/Department/Division: Conservation Department

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Location: Glacial Lakes State Park (Pope County), Hole-in-the-Mountain Prairie Preserve (Lincoln County), Minnesota Zoo (Dakota County). Implications throughout western and southern Minnesota prairie regions.

Total Project Budget: $800,000

Amount Spent: $798,575

Balance: $1,425

Legal Citation: M.L. 2019, First Special Session, Chp. 4, Art. 2, Sec. 2, Subd. 08a, as extended by M.L. 2022, Chp. 94, Sec. 2, Subd. 19 [to June 30, 2024]

Appropriation Language: $800,000 the first year is from the trust fund. Of this amount, $630,000 is to the Minnesota Zoological Garden and $170,000 is to the commissioner of natural resources to reestablish populations of Minnesota's imperiled butterflies through reintroductions and prairie restorations and by developing foundational habitat recommendations for preventing future extinctions. This appropriation is available until June 30, 2024, by which time the project must be completed and final products delivered.

I. PROJECT STATEMENT:

Goals: The Minnesota Zoo, DNR's Division of State Parks and Trails, and The Nature Conservancy (TNC) will develop a unique conservation research partnership to help save Minnesota's endangered prairie butterflies by:

1) Assessing factors associated with the disappearance of imperiled Minnesota prairie butterflies.
2) Restoring prairie at Glacial Lakes State Park to support endangered butterflies and other pollinators.
3) Reintroducing the US-Threatened/MN-Endangered Dakota skipper butterfly from the Zoo to TNC's Hole-in-the-Mountain Prairie Preserve (HIMPP) and Glacial Lakes State Park, where, until recently, it was common.
4) Developing foundational habitat management recommendations to sustain Dakota skipper populations.
5) Supporting Federal and State and Recovery and Risk Assessments for the Dakota skipper through conservation rearing, breeding, and wild reintroductions.

Opportunity: Many of Minnesota's prairie butterflies are disappearing at alarming rates, with some in danger of global extinction. Recovery of these pollinators depends on efforts to return them to prairies where they have disappeared and to manage habitat to promote their successful re-establishment.

Actions: We will help reestablish recently lost populations of Minnesota Endangered butterflies through reintroductions, habitat improvements, and advancing our understanding of what is needed to save them. We hypothesize that decreases in the Dakota skipper's preferred nectar plant (narrow-leaved purple coneflower) contributed to their recent extinction at sites like Glacial Lakes State Park, where pesticide drift and other external threats appear to be lower. We will study how reintroduced Dakota skippers respond to prairie wildflower augmentations and/or manipulations at Glacial Lakes and HIMPP, the latter of which already has high densities of blooming coneflower. Our work will help develop a management toolkit for restoring lost prairie butterfly populations and identifying additional reintroduction locations. We will help satisfy MS 86A.05 subd. 2(c) to "reestablish desirable plants and animals that were formerly indigenous to the park area but are now missing", as well as the goals of the Minnesota Prairie Conservation Plan, Minnesota State Wildlife Action Plan, and Monarch Joint Venture. Prairie restoration at Glacial Lakes State Park will benefit all pollinators, wildlife, and the Park's 56,000+ annual visitors.

II. OVERALL PROJECT STATUS UPDATES:

First Update November 30, 2019

Minnesota State Parks and Trails, The Nature Conservancy, and the Minnesota Zoo have established a partnership to advance Dakota skipper conservation and, more broadly, to develop a portfolio of actions that will facilitate prairie restoration using scientific methods. Much of the primary work will begin in future years, but we have been developing habitat management, reintroduction, and formal research plans. Significant additional planning will be occurring in the near future. During the first five months of the project, we have 1) designed and planted the new experimental vegetation manipulations at Glacial Lakes State Park, 2) restored prairie habitats at Glacial Lakes State Park and at Hole-in-the-Mountain Prairie Preserve, 3) collected and begun growing additional wildflowers for the experimental plots at Glacial Lakes State Park, 4) conducted a third year of Dakota skipper reintroductions at the Hole-in-the-Mountain Prairie Preserve, 5) established a new generation of Dakota skippers at the Minnesota Zoo for 2020 reintroductions, 6) conducted prairie butterfly diversity surveys, 7) collected additional data on the distribution and composition of pesticides in prairie remnants that house(d) Dakota skippers, and 8) assessed of the densities of narrow-leaved purple coneflower at Hole-in-the-Mountain Prairie Preserve.

Second Update May 31, 2020

Through the winter of 2019-2020, Minnesota Zoo, Minnesota Parks and Trails, and The Nature Conservancy have continued to closely and collaboratively identify research designs and protocols, maintain the world's only Dakota skipper *ex situ* conservation populations, and establish and implement habitat management

actions that will improve prairie conditions for current and future Dakota skipper reintroductions and other prairie wildlife. Some habitat management activities that had been planned for Spring 2020 have had to be postponed until Fall 2020 due to COVID-19, but we remain on track for executing our objectives. Large numbers of locally-sourced wildflowers from are also being grown at a contracted nursery for eventual planting at Glacial Lakes State Park in the experimental floral manipulation experiments where Dakota skippers are scheduled to be released starting in 2022. The Minnesota Zoo's population of Dakota skippers is larger than ever, and another robust reintroduction is planned for summer 2020 at The Nature Conservancy's Hole-in-the-Mountain Prairie Preserve. Key staff with this project have been granted travel authorizations and are planning additional distancing and sanitation procedures to help curtail COVID-19. The budgets associated with all activities are secure and expenditures have been with forecast needs.

Third Update November 30, 2020

The summer 2020 field season was successful for Dakota skipper rearing, breeding, reintroductions, and monitoring at The Nature Conservancy's Hole-in-the-Mountain Prairie Preserve. In addition to the release of more than 500 individuals into the Preserve that had been reared at the Minnesota Zoo, we were able to confirm that previous year's reintroduction efforts yielded successful production of a new wild 2019-2020 generation. This is a global first. Hundreds of additional larvae from breeding at the Minnesota Zoo are currently being reared for possible release in 2021.

At Glacial Lakes State Park, four research locations for the planned 2022 Dakota skipper reintroductions have been identified. The University of Minnesota graduate student supported by this project collected detailed baseline vegetation data at these sites during summer 2020. In November 2020, she was joined by resource staff from State Parks and Trails, the Minnesota Zoo, and volunteers from the Friends of Glacial Lakes State Park to begin planting thousands of plugs of native wildflowers into the experimental plots where Dakota skipper reintroductions will eventually take place.

All budget items are secure and expenditures have been within forecast needs.

Fourth Update May 31, 2021

We have continued to make progress towards our goals through the winter and spring of 2020-2021. Additional prairie and savannah enhancements are being completed as planned at Glacial Lakes State Park in preparation for the planned 2022 Dakota skipper reintroductions. Additional planning and training is underway for habitat quality and floral abundance surveys at prairies, including through the use of drone aerial imagery. At the Minnesota Zoo, the rearing and breeding conservation program for the Dakota skipper remains robust, with very high overwintering survivorship. Preparations are underway for a new set of 2021 reintroductions into two southwest Minnesota Wildlife Management Areas within the Hole-in-the-Mountain prairie complex adjacent to the 2017-2020 reintroduction locations. The goal of releases in these new locations is to increase Dakota skipper population redundancy and ultimately begin re-establishing metapopulation dynamics across the greater Hole-in-the-Mountain complex. These releases will be the first ever reintroductions of Dakota skippers onto State managed lands, and will also provide additional opportunities to research the effects of various prairie management and enhancement on Dakota skipper reintroductions.

All budget items are secure and expenditures have been within forecast needs.

Fifth Update November 30, 2021

The extreme drought of 2021 significantly negatively affected operations. First, there was unfortunately almost no survivorship of newly planted wildflowers in the experimental floral supplementation plots where Dakota skippers reintroductions are to planned to occur for Activities 1 and 2. Utilizing the last available wildflower plugs, we were able to revise the project slightly and re-plant three of the four original plots. However, we do not believe that these replacement plants will be sufficiently mature to bloom in time for the

Dakota skipper reintroduction as planned. Effectively a year of investment for this activity was killed by once-in-a-generation drought.

We released more than 1400 Dakota skippers from the Minnesota Zoo into two Wildlife Management Areas in Lincoln and Pipestone Counties. This is a first for State-managed lands. Partnering with the DNR, we observed dozens of reintroduced adults (as well as some subsequently produced wild eggs) through robust monitoring at these WMAs. We also observed a few individuals at The Nature Conservancy's adjacent preserve where previous releases occurred. The drought appears to have negatively impacted wild butterfly and pollinator populations.

We are trying to advance the Activity 3 research on landscape mechanisms shaping Dakota skipper persistence, but multiple years of backlogged data need to be entered into the federal database before analyses can move forward. We are trying to expedite this work.

All budget items are otherwise within forecast needs.

Sixth Update May 31, 2022

We made the difficult decision to postpone the planned reintroduction of Dakota skippers to Glacial Lakes State Park for a year, to summer 2023. This was prompted by the 2021 drought induced mortality to the Fall 2020 planted wildflowers ahead of the planned reintroduction experiment. The decision was made in consultation with all parties (Zoo, Parks and Trails, University of Minnesota, US Fish and Wildlife Service, and The Nature Conservancy). We consulted with LCCMR staff about the consequences of this postponement to associated timelines and budgets. A 1-year extension for this project, to June 30, 2024, was included in the Conference Committee agreement passed by the Minnesota Legislature in May 2022.

Parks and Trails staff were able to conduct additional habitat improvements at Glacial Lakes State Park, including savanna enhancements and prairie prescribed burns, in spring 2022.

The Dakota skipper population at the Minnesota Zoo remains robust. Instead of the previously planned reintroductions of these individuals at Glacial Lakes State Park, we are instead planning to resume releases in 2022 at The Nature Conservancy's Hole-in-the-Mountain Prairie Preserve.

All expenditures have been within forecast needs, although we are strategizing about potential adjustments that may be needed given the 1-year extension.

Seventh Update November 30, 2022

Following the 2021 drought-induced postponement of reintroductions to Glacial Lakes State Park, the Minnesota Zoo shifted Dakota skipper reintroductions back to The Nature Conservancy's Hole-in-the-Mountain Prairie Preserve in 2022. We released a large number of Zoo-reared individuals from several lifestages (adults, eggs, young larvae). These releases were paired with surveys to improve our understanding of factors influencing local persistence and dispersal and the ongoing impacts of reintroduction efforts. Surveyors observed 52 adults at the Preserve, composed of either wild individuals resulting from the 2017-2020 reintroductions or the release of new 2022 individuals.

The managed Dakota skipper population at the Zoo remains robust with thousands of individuals currently on-hand following another year of significant breeding and new wild collections. These will be the source for 2023 reintroductions to Glacial Lakes State Park.

Parks and Trails staff continued prairie management and enhancements at Glacial Lakes State Park through brush removal. Weather conditions unfortunately hampered prescribed burn plans.

We continue to consult with the US Fish and Wildlife Service and others to determine the possible scope and research avenues for improving our understanding of conditions influencing persistence of wild populations and parallel federal recovery goals.

All expenditures are within currently forecast budgets, although small adjustments may be needed in the future given the 1-year extension.

Eighth Update May 31, 2023

The winter of 2022-2023 was mostly spent planning ahead for Dakota skipper reintroductions at Glacial Lakes State Park and the associated butterfly and parallel vegetative monitoring. The Minnesota Zoo has maintained a large population of Dakota skippers that will be the source for these reintroductions. State Parks and Trails staff continued prairie and oak savanna enhancement efforts at Glacial Lakes State Park. After several years of delays, they were able to conduct prescribed burns at the sites where Dakota skippers are planned to be released and in other areas.

Research on the factors that may affect Dakota skipper persistence has slowed somewhat but will resume following the busy summer season.

Zoo and Parks staff are planning coordinated outreach associated with the Dakota skipper reintroduction later this summer.

We remain in contact with, and have indeed expanded, the network of Dakota skipper biologists, scientists, and policy makers, across State, Federal, international, and local levels.

All expenditures have remained within budget, but some small re-adjustments may need to be requested in the future to compensate for the 1-year extension and for COVID-related reductions in travel.

Legislative Extension Approved June 3, 2022

Nineth Update November 30, 2023

Fifteen years after their last documented occurrence and following years of planning and coordination, Dakota skippers were reintroduced to Glacial Lakes State Park in 2023. Over the course of a few weeks, more than 1000 Dakota skipper adults and other life stages were released at three points in the park. Concurrent with these releases were intensive surveys for Dakota skippers as well as for the floral composition at the release points. We will cross-reference these databases to improve our understanding of some local factors that may influence Dakota skipper dispersal and behavior. We are also working to build upon a new multi-state Dakota skipper habitat occupancy model that has been developed by external federal researchers.

An additional large generation of Dakota skippers was produced via managed breeding at the Minnesota Zoo in 2023. These individuals will comprise an additional release effort in 2024.

Parks and Trails staff continued to enhance prairie conditions across Glacial Lakes State Park, particularly adjacent to the Dakota skipper reintroduction points.

Minnesota Zoo staff continue to coordinate with many external partners to develop detailed conservation actions that align with federal recovery goals.

Many budget line items have now been fully utilized. We are requesting a small shift in the Minnesota Zoo's budget from surplus travel funds to personnel support.

AMENDMENT REQUEST November 30, 2023

We are requesting funds be shifted from the Minnesota Zoo travel budgets to Minnesota Zoo personnel.

- Out-of-State travel budget would be reduced by all of the remaining $1,753 to a revised remaining budget of $0.
- In-State travel would be reduced by $3,241 to a revised remaining budget of $1,600.
- Minnesota Zoo personnel budget would increase by $4,994 to a revised remaining budget of $53,090.

Travel restrictions due to COVID-19 as well as other slight programmatic adjustments over the years have reduced total travel costs for Minnesota Zoo's activities. This is more than offset though by significant Minnesota Zoo personnel FTEs that will still be required to accomplish the final deliverables for this project. Some in-state travel funds will need to be retained for early summer field work to prepare for 2024 releases.

"**Amendment Approved by LCCMR 2/27/2024**."

Tenth Update May 31, 2024

The majority of the activities associated with this project have been completed or are nearing completion. We are in the process of conducting final summary analyses. The Minnesota Zoo has again maintained a large population of Dakota skippers at the Zoo, most of which will be released at Glacial Lakes State Park in June and July to support the reintroduction effort initiated in 2023. We will continue monitoring at the release points in 2024 and beyond to continue to assess the efficacy of the reintroduction efforts and the behavioral and dispersal responses of resulting adults to the floral augmentations implemented in this project. DNR Staff at Glacial Lakes State Parks have are planning to continue prairie enhancement this spring and summer.

We have published a new scientific paper on pesticides occurrence and quantities observed in several prairies, crediting the LCCMR as a key funding source. Zoo and Parks staff were highlighted at a well-attended prairie conservation outreach event at the Bell Museum.

The project budget has now been nearly fully drawn down. We expect the remaining funds will be utilized by the conclusion of the project as planned.

Final Report between project end (June 30) and August 15, 2024

Recovery of Endangered butterflies requires the protection and proper management of their habitats, but also the re-establishment of lost populations. We sought to improve our understanding the factors that drive population persistence and the tactics needed to achieve it. We have combined management and floral enhancement of hundreds of acres of prairie with multiple years of intensive reintroductions of the Dakota skipper (US Threatened, MN Endangered). Minnesota Zoo scientists reared and released thousands of individuals over the course of this project at multiple Minnesota preserves and precisely tracked their movements. Reintroductions were challenged by multiple years of extreme weather, but positive signs have been observed.

Prairies, especially the few remaining historic remnants, must be protected. Their management must also be done in a manner that fosters diversity. Dakota skippers and many other prairie butterflies not only require specific conditions but usually lack the ability to re-colonize prairies without help across a fragmented landscape. Management to maintain optimal ecological conditions can employ a diversity of tools (including potentially fire, grazing, haying, spot treatments), but such management needs to follow detailed patchwork, rotational plans to avoid causing local extirpations. We have documented that Dakota skippers in Minnesota are reliant on upland gravel prairies with high concentrations of their strongly-preferred nectar source (narrow-leaved coneflower), and that invasive grasses (particularly smooth brome) are major threats by choking out native vegetation and serving as ecological traps to their grass-feeding larvae. Beyond these prairie remnant islands, we need to understand and potentially mediate external stressors from surrounding landscapes. For example, we have published foundational data on the near universal presence of dozens of non-target pesticides in these and other prairie remnants designated as Critical Habitat for these federally-listed butterflies. Creating and enhancing quality habitat for Dakota skippers will also support other declining grassland-dependent wildlife and game.

III. PROJECT ACTIVITIES AND OUTCOMES:

ACTIVITY 1 Title: Enhancing Prairie at Glacial Lakes State Park for Pollinators

Description: MN State Parks and Trails will restore and enhance native prairies at Glacial Lakes State Park for the reintroduction of Dakota skipper. This will be done by 1) experimentally manipulating the density, abundance, etc. of certain native flowers/grasses within the range of natural variation for those species locally, 2) controlling woody species encroaching into native prairie, and 3) increasing native wildflower and grass densities in remnant and reconstructed prairie.

ACTIVITY 1 ENRTF BUDGET: $ 170,339

Outcome	Completion Date
1. Establish plot locations/ design; plant 10,000 plugs of wildflower species known to be important for Dakota skippers and other pollinators	November 2019
2. Finalize planning for experimental vegetation manipulation in established plots, implement year-1 manipulations	October 2020
3. Diversify degraded remnant prairies and restorations (400 acres); reduce woody stems encroaching into prairie (200 acres), thin 50 acres of savanna adjacent to skipper habitat	June 2021

First Update November 30, 2019

State Parks and Trails (PAT) staff have initiated habitat modifications at Glacial Lakes State Park to advance our goals in accordance with the identified outcomes. In partnership with the Zoo, three locations for the floral manipulation experiment plots have been determined. Across these three plots, 4680 plugs of Park-sourced narrow-leaved purple coneflower have been planted. An additional 2000 coneflowers and 1500 plains coreopsis have also been started at a nursery for planting into the plots in 2020. In 2019, PAT staff also collected seeds of multiple flower species (coneflower, vervain, black-eyed susan, and purple prairie clover) from the Glacial Lakes State Park, and these will also be grown at the nursery for planting in 2020.

In addition to the manipulations at the experimental plots, other habitat improvements have been occurring. Seeds of a wide range of plants have been harvested to begin diversification across Glacial Lakes State Park. Targeted reductions of woody stems were conducted in Fall 2019, particularly occurred through herbicides and mulching across 75 acres, particularly near Plot 1. Savanna thinning also occurred in late 2019 to expand prairie near Plot 1.

Second Update May 31, 2020

Despite some limitations imposed by COVID-19, State Parks and Trails staff have continued to advance habitat modifications at Glacial Lakes State Park. Thirty-one acres of degraded dormant prairie within the Park that are known to hold significant quantities of *Echinacea* were able to be mowed in early spring before resource activities were sidelined. This area will be monitored for blooms this summer to evaluate the effects.

PAT staff have corresponded with Zoo staff to determine the locations and configurations of three experimental wildflower arrays that will be the centers of the Dakota skipper reintroductions planned for 2022. A fourth experimental array site within the Park may also be selected in late 2020. The scheduled planting of 2000 coneflowers and 1500 plains coreopsis into these experimental arrays had been scheduled for spring 2020 but has been delayed by COVID-19. An additional 15,025 plants from nine Park-sourced species of wildflowers (see table below) have also been started at a contracted nursery. Collectively, these 18,525 plants are scheduled to be planted into the experimental arrays in October 2020.

Latin Name	Common Name	2020 Estimated Number of plugs
Astragalus crassicarpus	Ground Plum	975
Cirsium flodmani	Flodman's Thistle	975
Coreopsis palmata	Stiff Coreopsis	2000
Dalea sp.	Prairie-Clover	975
Echinacea angustifolia	Narrow-leaved Purple Coneflower	6200
Lilium philadelphicum	Wood Lily	975
Oenothera biennis	Common Evening Primrose	975
Phlox pilosa	Prairie Phlox	975

Rudbeckia hirta	Black-eyed Susan	975

2018 Seed Plugs, ready spring 2020		Number of plugs
Coreopsis palmata	Stiff Coreopsis	1500
Echinacea angustifolia	Narrow-leaved Purple Coneflower	2000

Third Update November 30, 2020

Parks and Trails staff joined with Minnesota Zoo staff, University of Minnesota, and seven volunteers from the Friends of Glacial Lakes State Park to plant 5,252 plugs grown from seed harvested at Glacial Lakes State Park on November 3rd and 4th, 2020. The prairie plants were divided equally among the four experimental design plots. Overall, 1020 black-eyed susan, 1584 narrow-leaved purple coneflower, 420 purple prairie clover, 992 common evening primrose, and 1236 stiff coreopsis were planted. Several thousand additional plugs of these species will be planted into the four plots in 2021.

Prairie habitat enhancement continued adjacent to release sites 1 and 2. Narrow-leaved purple coneflower seed was hand seeded intermittently in three acres adjacent to release site number 1. All 75 acres of prairie that was mulched to reduce woody stem competition in fall 2019, was again mowed during summer and fall 2020. An additional 99 acres of remnant prairie adjacent to release site number 2 was mulched for the first time to reduce brush and 12 acres of tree covered prairie in that area was thinned to create a more savanna-like arrangement of the oaks.

Fourth Update May 31, 2021

Furthering the goal of improving savanna habitat, Parks and Trails staff removed approximately 60 cords of wood down-slope from release site 2 during winter and spring 2021. Parks and Trails staff continue to support the newly established experimental floral plots. Additional floral supplementations are scheduled to be planted into the experimental plots in Fall 2021.

Fifth Update November 30, 2021

Unfortunately, the extreme spring and summer 2021 drought killed almost all the young wildflower plugs in the floral experiment plots for the planned Dakota skipper reintroduction. As a result, virtually all plots needed to be fully re-planted in October 2021, using the last batch of plugs designated for the project. Importantly, we do not expect these plants to be mature enough to bloom by the summer of 2022 in time for the currently planned Dakota skipper reintroduction, and we are likely going to re-assess the timeline for the reintroductions. To achieve sufficient floral density variation within the experimental arrays, we also had to reduce the number of plots (=Dakota skipper release locations) from four to three. Parks and Trails staff, with assistance from UMN graduate student Emily Royer, planted 8616 flowering prairie plants into these plots.

DNR Parks and Trails staff also drilled flower seed into 150 acres of grassland to pollinator habitat. 225 acres of brushy prairie were mulched to enhance the quality of remnant prairies and 150 acres were mowed to continue the woody stem reduction started over the past 2 years. Staff continued removing trees to enhance oak savannas at Glacial Lakes State Park.

Sixth Update May 31, 2022

Parks and Trails staff opened 4.5 acres of trees from a savanna area that holds high potential for the herbaceous layer to rebound now that the trees removal and mulching are accomplished. Prescribed burns were performed in 60 acres of high quality prairie in early April 2022, including adjacent to the experimental floral supplementation plots. Seed from these sites will continue to diversify Glacial Lakes State Park prairies

which enhances the value of these lands for all pollinators. All of this work was done without use of ENRTF funds.

Seventh Update November 30, 2022

Parks and Trails staff continued brush removal near the planned Dakota skipper release sites at Glacial Lakes State Park. Sumac was mulched on 21 acres adjacent to site 1. Burn breaks were installed around the release sites in preparation for prescribed fire, but we were unable to burn the release sites due to incompatible weather conditions. Unfortunately, native prairie seed, predominantly narrow-leaved purple coneflower, was illegally harvested from the area adjacent to and including site 1 by an unknown party.

Eighth Update May 31, 2023

Parks and Trails staff continued savanna improvement work in the critical habitat, opening up approximately 5 more acres. On April 24-25th, PAT staff along with 6 DNR Forestry employees completed approximately 550 acres of prescribed fire, which included all of the release sites and recently worked savanna sites.

Nineth Update November 30, 2023

Parks and Trails (PAT) staff continued savanna improvement work in the critical habitat, opening up approximately 3 more acres. 50 acres of prairie was interseeded with forbs and 160 acres of brush was removed from the prairie near sites 1 and "site 5" near Baby Lake. PAT staff assisted with the release of Dakota Skippers and participated in media outreach as well as local outreach. Glacial Lakes experienced a major effort of unauthorized seed collection again in the late summer/fall of 2023, with a significant portion of the coneflowers being harvested throughout the park. A large effort of monitoring was put in place and seed theft will be of concern in the future.

Tenth Update May 31, 2024

Parks and Trails (PAT) staff continued savanna improvement work on approximately 7.5 acres of habitat adjacent to the 2023 Dakota skipper reintroduction release sites. Conservation grazing continued in areas adjacent to the release sites, covering 277 acres.

Final Report between project end (June 30) and August 15, 2024

PAT staff continued forb diversification on 25 acres of habitat south of the Baby Lake release site. Conservation grazing continued on 92 acres around the large wetland complex south of release site 3. Grazing is scheduled in fall of 2024 on 147 acres south of Baby Lake and east of Kettle Lakes.

Spring rains have removed drought concerns for the time being and produced one of the best coneflower blooms in recent memory. Unfortunately, Glacial Lakes experienced another significant round of unauthorized seed collection in August of 2024. As in the past, coneflower was heavily targeted and much of the seed heads that bloomed were harvested. Ongoing monitoring will remain in place into the foreseeable future with the hope of stopping the seed theft.

The final totals for habitat work completed are as follows (see accompanying maps):

- 18,548 individual plant plugs were planted by hand. PAT staff, Zoo staff and volunteers helped in a collaborative effort.
- Brush reduction across 698 acres and multiple entries. 400 acres initially planned.
- Tree removal/savanna enhancement across 52 acres and multiple entries. 50 acres initially planned.

- Forb diversification across 214 acres. 400 acres initially planned.
- Prescribed fire across 571 acres.
- Conservation grazing across 476 acres and multiple entries.

ACTIVITY 2 Title: Reintroducing Endangered Prairie Butterflies

Description: The Zoo will help save Minnesota's Threatened and Endangered butterflies through its foundational rearing, breeding, and release programs. The Zoo will produce at least 200 Dakota skippers annually, then release and monitor those individuals at HIMPP and then at Glacial Lakes State Park to help re-establish lost populations and understand conditions they need in the wild. Reintroductions at HIMPP began in 2017 and will be expanded to strengthen the viability of the population. Reintroductions at Glacial Lakes will occur once planted flowers mature and bloom.

ACTIVITY 2 ENRTF BUDGET: $510,661

Outcome	Completion Date
1. Perform years 3, 4, and 5 of Dakota skipper reintroductions at HIMPP	August 2021
3. Perform year 1 of Dakota skipper reintroductions and monitoring at Glacial Lakes State Park. Monitor Dakota skippers at HIMPP	August 2022
4. Establish plans for 2023 reintroductions and augmentations	June 2023

First Update November 30, 2019

The Minnesota Zoo completed the third year of Dakota skipper reintroductions at The Nature Conservancy's Hole-in-the-Mountain Prairie Preserve as planned in July 2019. Zoo staff released about 480 adult Dakota skippers that had been reared over the previous year at the Minnesota, surpassing our 2019 goal of 400 adults. The releases were delayed a few weeks later than is typical due to an extended cool and wet spring, but we were still successful in synchronizing the development of Dakota skippers reared at the Zoo with the narrow window of the peak bloom of their likely preferred adult nectar source, narrow-leaved purple coneflower. Releases of adults were intentionally conducted in areas of the Preserve where the coneflowers were in dense bloom (see the update in Activity 3 below), over a three week period from July 6 to July 26. As with the 2017 and 2018 reintroduction efforts (see ENRTF updates for the separate previous project M.L. 2016, Chp. 186, Sec. 2, Subd. 03c1), Dakota skippers were reared to pupation at the Minnesota Zoo and then brought to the Preserve where they were released daily into the wild as they reached adulthood.

Zoo staff conducted surveys for Dakota skippers, and all other butterflies, across the Preserve during this timeframe as well. Extended periods of heavy rain, as well as personnel demands for other Prairie Butterfly Conservation Programs unrelated to this ENRTF allocation, reduced the number of surveys that could be performed. Nonetheless, over 50 skippers were re-sighted during the reintroduction effort across eight surveys days, including five mating pairs. Sightings were clustered within a few hundred meters of the two main release points (similar to the pattern in previous years), but encouragingly, individuals were also seen in new areas of the Preserve, on other ridges containing good habitat to the south and east of the main ridge where reintroductions have been taking place.

Preparations are underway at the Minnesota Zoo for the 2020 rearing and reintroduction efforts. We have established a new large generation of Dakota skippers, produced through carefully managed breeding of additional Dakota skippers at the Minnesota Zoo in July 2019 and through additional eggs from wild females temporarily collected under numerous permits from populations on Sisseton Wahpeton Oyate lands in northeastern North Dakota. We expect that several hundred adults from this pool could be eligible for additional reintroductions in 2020.

Second Update May 31, 2020

Zoo staff have continued to coordinate with staff from The Nature Conservancy and the Minnesota Department of Natural Resources to plan the logistics of the 2020 releases at Hole-in-the-Mountain Prairie Preserve in late June and early July as well as the associated monitoring of Dakota skippers in the wild across the Preserve. The Dakota skipper conservation population at the Minnesota Zoo has also reached a new record size. We estimate that we entered the winter of 2019-2020 with over 1300 Dakota skipper caterpillars, derived from a combination of new egg collections in North Dakota (for a new separate project, not funded by the ENRTF), egg collections in South Dakota, and breeding at the Zoo. Those caterpillars were brought out of hibernation and inventoried by mid-May, and initial estimates (pending final tabulation) indicate a total population size of about 900 caterpillars. These overwintering survival estimates are consistent with prior years. Of these, about 400 are derived from the South Dakota- and Zoo-bred lineages, and therefore would be eligible when they reach adulthood for reintroductions at Hole-in-the-Mountain Prairie Preserve or for continued breeding at the Zoo in late June and early July 2020.

Discussions are still underway at the time of this writing, but a more passive form of reintroduction may be employed in 2020. Instead of manually releasing new adults to the wild as they emerge daily from the secure metal screen box as in previous years, we are considering retaining Dakota skippers inside a large, well-provisioned, walk-in screened cage or series of cages at Hole-in-the-Mountain for at least a portion of the flight. This modification will 1) provide greater opportunities to census the size of the wild Dakota skipper population at Hole-in-the-Mountain before the release of 2020 Zoo-reared adults, 2) hopefully increase the probability that adults in the cages will breed before being released, and 3) reduce staff demands and allow for greater COVID-19 distancing.

Third Update November 30, 2020

Rearing and breeding with Dakota skippers at the Minnesota Zoo and subsequent reintroductions at The Nature Conservancy's Hole-in-the-Mountain Prairie Preserve were successful in 2020. We developed a new release method to 1) conduct pre-release surveys at the Preserve for Dakota skippers, 2) increase breeding frequency, and 3) reduce staff demands. Instead of directly releasing adults into the prairie daily as they emerged from their pupae by manually opening a protective screen box, adults were allowed to self-release into a large 6x6x6' mesh tent securely placed into the prairie over a wild patch of high density purple coneflowers and native grasses. Pupae were placed into microcentrifuge tube racks, which were then placed in an open-sided birdfeeder with a clear roof which was then attached to the top of a post 1 meter above the ground within the enclosure. Thus, pupae and emerging adults were protected from weather and predators, and adults could fly around inside the enclosure for days with ample flower resources and shelter and also be afforded breeding opportunities. This soft release enclosure was established June 30, 2020, and was not opened again until July 3 when the first ~50 adults were released. Additional adults were released every 2-3 days through July 13. All individuals were in good condition upon release.

In addition to the 250 pupae brought the Preserve, we also directly released about 120 adults that had emerged at the Minnesota Zoo. All of these individuals were carefully marked at the Zoo so that they could be differentiated from any wild Dakota skippers. Happily, Zoo staff located four unmarked Dakota skippers during surveys before the enclosure was first opened. We can say with high confidence that these individuals were the offspring of wild reproduction at the Preserve in 2019. This confirms that, thanks to this reintroduction program, Dakota skippers have been breeding and producing viable complete generations in the wild at the Preserve (and indeed likely all of southwest Minnesota) for the first time in at least 8 years.

At least 15 females of the released females also bred: 11 at the Zoo and 4 within the field enclosure. We placed an additional 150 eggs and five larvae from the Zoo matings into known locations in prairie grasses at the Preserve. At least 100 more eggs were also laid within the enclosure. Thus, in additional to confirming a successful 2019-2020 wild generation at the Preserve, about 370 new adults and 250+ of their offspring were released at the Hole-in-the-Mountain Prairie Preserve in 2020.

Managed Dakota skippers breeding was also successful at the Minnesota Zoo. We expect several hundred more adults will be eligible for additional releases in 2021.

The Nature Conservancy continues to manage habitat at the Preserve, enhancing prairie and reducing invasive species while promoting Dakota skippers.

Fourth Update May 31, 2021

The Dakota skipper conservation population at the Minnesota Zoo remains very robust. We entered the spring of 2021 with likely more than 1300 Dakota skippers. During winter and spring of 2020-2021, we have concentrated on planning for 2021 releases and monitoring. New releases are going to be paused at The Nature Conservancy's Hole-in-the-Mountain Prairie Preserve in 2021 so that the efficacy of the 2017-2020 releases can be measured through intensive monitoring in 2021 and 2022. The monitoring scheme is being developed in cooperation with the Minnesota Department of Natural Resources. The Nature Conservancy continues to provide excellent land management at the Preserve.

Another long-term goal of the reintroduction effort is the expansion of releases into adjacent Wildlife Management Areas (WMA) in adjacent of prairies in the Hole-in-the-Mountain complex. We are planning to initiate these new releases in 2021, into both the Hole-in-the-Mountain WMA and Altona WMA (Lincoln and Pipestone Counties). We expect several hundred adult Dakota skippers will be released into each WMA in summer 2021. Each WMA will also be surveyed for Dakota skippers. This will constitute the first reintroduction of Dakota skippers back onto State managed lands, and should increase population redundancy within the prairie complex.

Fifth Update November 30, 2021

Dakota skipper reintroductions and rearing operations at the Minnesota Zoo mostly went forward as planned. 2021 marked the first reintroductions of Dakota skippers onto State-managed lands, at the Hole-in-the-Mountain WMA and the adjacent Altona WMA. The drought reduced nectar sources, so we retained individuals at the Minnesota Zoo 1-2 weeks longer than typical so that we could 1) provide them with more resources and 2) increase opportunities for breeding prior to release. Ultimately, we released 678 individuals into Hole-in-the-Mountain WMA and 763 individuals at Altona WMA, spanning multiple life stages in late June and early July.

We monitored Dakota skippers (and other butterflies) at these WMAs and The Nature Conservancy's adjacent Hole-in-the-Mountain Prairie Preserve (HIMPP) where prior reintroductions have occurred. As planned, we did not release another generation at HIMPP so that the effectiveness of the prior releases could be evaluated. Happily, we observed multiple Dakota skippers in all release locations, including at HIMPP where no releases occurred. We also found several wild viable eggs, raising hopes for re-establishment of these lost populations. We are absolutely worried about the impact of the drought on the persistence of these and other wild populations though.

Robust rearing and breeding operations continued, with approximately 1300 Dakota skipper caterpillars currently in hibernation at the Minnesota Zoo.

Sixth Update May 31, 2022

Most activities through the winter of 2021-2022 have focused on planning for 2022 field operations, particularly the form and scope of the next round of Dakota skipper releases and associated monitoring.

We made the difficult decision to postpone the planned 2022 releases to Glacial Lakes State Park until 2023 so that the experimental wildflower arrays would be able to mature and bloom more significantly at the time of releases. We decided then to resume releases to The Nature Conservancy's Hole-in-the-Mountain Prairie Preserve. These releases will occur in the same area as prior years to hopefully supplement the burgeoning new wild population that has resulted from prior releases at the Preserve. The size of the Dakota skipper population at the Minnesota Zoo following hibernation was about as previously forecast, so we expect to be able to release several hundred additional individuals this summer. We will also support surveys of wild populations at the Preserve and at the Wildlife Management Areas where reintroductions occurred in 2021.

Seventh Update November 30, 2022

Minnesota Zoo conducted another year of releases of Dakota skippers at The Nature Conservancy's Hole-in-the-Mountain Prairie Preserve in 2022. Overall, the releases went well, with nearly 1000 adults and almost another ~2000 surplus eggs and young larvae (of which survivorships is expected to be lower) from the Zoo released. Surveys for Dakota skippers and other species were also conducted at the Preserve from late June to mid July, along established transects and in meandering routes. Fifty-two Dakota skipper adults were seen during these surveys at the Preserve. Most newly released adults were not marked due to personnel capacity limitations and the sheer number of individuals released, so we could differentiate between most adults that were reared at the Zoo or those that were the product of potential wild reproduction at the Preserve. Minnesota DNR (external to this ENRTF appropriation) also conducted a limited number surveys at the two Wildlife Management Areas where the 2021 reintroductions occurred, but unfortunately did not observe Dakota skippers. We are not planning to conduct releases at the Preserve in 2022 but will continuing monitoring for Dakota skippers at the Preserve and the WMAs.

The Dakota skipper population at the Minnesota Zoo remains robust. Following another year of successful breeding at the Zoo as well as an infusion of new genetic lineages from healthy wild populations in South Dakota, we are likely entering the winter with over 2000 larvae. These will be the source for the reintroduction at Glacial Lakes State Park in 2022.

Eighth Update May 31, 2023

The managed Dakota skipper population at the Minnesota Zoo has remained strong. Larvae were transitioned into winter diapause in late November and brought out in mid-May 2023. Survivorship was strong, as expected. We anticipate that we will be able to release at least several hundred adults to the designated experimental release points in the coming months. We have worked on developing butterfly survey protocols and solidifying associated logistics, both at the Glacial Lakes State Park reintroduction locations as well as at the sites of prior year releases. We are also identifying survey protocols to link these butterfly observations with vegetation and other environmental variables to improve our understanding of the factors that promote local persistence.

Nineth Update November 30, 2023

After years of coordination and a significant effort to build a large conservation population at the Minnesota Zoo, Dakota skippers were reintroduced at Glacial Lakes State Park. Over 1000 individuals were released from three release plots across the park from late June through mid-July. We established multiple transects through each plot, and conducted butterfly surveys every few days throughout the flight. We documented the precise location of every Dakota skipper observation with a sub-meter GPS. We also conducted inventories of floral composition and abundance, similarly mapping with sub-meter accuracy the location and identity of every flower in the 60x60 meter plots. These two datasets will allow for resource selection function analysis, to improve our understanding of how the composition and availability of floral resources influence Dakota skipper dispersal patterns and behavior. This data will be analyzed in the coming months.

We also surveyed at the Hole-in-the-Mountain Prairie Preserve following the 2022 releases of Dakota skippers. Unfortunately, no individuals were seen on three survey days by Minnesota Zoo staff. Additional efforts by external surveyors also did not detect Dakota skippers in these areas. None were seen as well at the two WMAs where releases occurred in 2021. We do not understand what factors may have inhibited the chances for establishment, but extended drought from 2021 through 2023 likely did not help. Additional surveys are planned in this area in 2024.

Minnesota Zoo continued breeding Dakota skippers during the summer of 2023, with about 2000 young caterpillars produced. These individuals have entered winter hibernation, and they will form the core of additional planned releases in 2024.

Tenth Update May 31, 2024

The Minnesota Zoo continues to maintain a robust population of 900-1000 Dakota skippers. Nearly all of the individuals were necessarily overwintered securely outdoors. Following the warmest winter on record with almost no snow, survivorship appears to have been somewhat lower than normal for those that hibernated outdoors (vs a specialized freezer that mimics conditions under a healthy snowpack), with potentially increased late winter mortality outside that we have not observed before. Nonetheless, we anticipate we will be able to produce another large release of Dakota skippers at Glacial Lakes State Park in June and July to augment the initial large reintroduction conducted in 2023. We will conduct butterfly surveys at the State Park in 2024 to assess the impact of the releases and how the skippers are dispersing across the prairie. Additional surveys are planned by external researchers at Hole-in-the-Mountain Prairie to search for Dakota skippers (and other butterflies) from prior reintroduction efforts.

Final Report between project end (June 30) and August 15, 2024

Minnesota Zoo staff conducted another release of Dakota skippers at Glacial Lakes State Park in late June and early July 2024. We released about 500 adults and pupae as well as more than 2000 eggs produced by breeding of many of these adults at the Zoo. Releases were conducted at Site 3 and Site Baby Lake. We did not release individuals at the 2023 release Site 1 to increase the numbers that could be released at Site 3 and Baby Lake and to serve as a control for 2024 surveys. Ecological conditions were somewhat better at the Baby Lake than at Site 3, with more abundant narrow-leaf coneflower (*Echinacea angustifolia*, primary adult nectar source) and prairie dropseed (*Sporobolus heterolepis*, high quality larval host grass). Site 3 also had areas of non-native white and yellow sweet clover *(Melilotus albus* and *officinalis*) that had not been particularly present in prior years, likely due to the heavy spring rains.

Following 3 years of drought and a 2023-24 winter with virtually no snow, the weather swung wildly in the opposite direction in early 2024 with the wettest April-June on record. As a result, extensive cloud cover and rain limited opportunities for surveys (butterflies are not active when it is cloudy), and unfortunately only a single day of surveys under optimal conditions could be conducted during the weeks when wild Dakota skippers may have been present. All surveys were conducted prior to any releases of new individuals brought from the Zoo on the same day. We observed a total of 13 Dakota skippers in the vicinity of the Site 3 and Baby Lake release locations in 2024. Ten were unmarked (and therefore could be either individuals brought from the Zoo as pupae that self-released or could be wild individuals that were the progeny of 2023 releases), one was an individual that had been marked at the Zoo prior to release and then observed at least five days after initial release, and two were of unknown mark status. All were observed within about 210 m of a known release point, in line with prior maximum distance observations from other release events (maximum = 300m in 2023 at Glacial Lakes, 350 m in 2020 at Hole-in-the-Mountain Prairie Preserve). Unfortunately, none were observed at Site 1 where no individuals were released in 2024 but we also could not conduct a desired number of surveys. We were also unable to survey at Hole-in-the-Mountain in 2024.

With the support of this grant, we reintroduced more than 1500 Dakota skipper adults and thousands of their eggs to Glacial Lakes State Park over two years, in addition to the more than 1000 additional individuals released at the Hole-in-the-Mountain Prairie Preserve, Hole-in-the-Mountain WMA, and Altona WMA. Extreme climatic conditions over the entire span of this project have presented significant challenges to these reintroduction efforts. Three summers of intense drought (2021-2023) reduced the availability of quality host grasses, the snowless 2023-2024 winter provided no insulating protection, and then the extremely wet and cloudy conditions of early 2024 reduced the number of days for adults to be active and breed. Beyond Dakota skippers, insect and pollinator numbers appear to broadly and significantly depressed in 2024, likely reflecting the compounding effects of multiple years of challenging conditions. Glacial Lakes State Park (and many other places) felt “empty” during butterfly surveys even under good conditions in 2024. The continued illegal harvest of *Echinacea* at Glacial Lakes State Park may have also hindered 2023 establishment by reducing the availability of their strongly preferred nectar source. It is also possible that significantly more individuals may need to be

released into high-quality habitat patches (thousands instead of mid-hundreds) in a year than we have had the capacity to conduct to increase the chances for the re-establishment of Dakota skipper populations.

ACTIVITY 3 Title: Understanding prairie butterfly disappearance and factors needed for recovery

Description: The Zoo will sponsor a University of Minnesota graduate student to compile and use historical data to assess factors associated with the disappearance of imperiled prairie butterflies like the Dakota skipper. Additionally, the student will study how purple coneflower density, management practices, pesticides drift, and other environmental factors alter prairie habitat and affect establishment of reintroduced Dakota skippers at HIMPP and Glacial Lakes. Results of the work can be applied broadly and scaled up to identify management actions and additional prairies for future Dakota skipper reintroductions.

ACTIVITY 3 ENRTF BUDGET: $119,000

Outcome	Completion Date
1. Complete analysis of factors that have influenced disappearance of prairie butterflies from historically occupied sites	July 2022
2. Collect plant, pesticides residue, and environmental data before and after experimental habitat management activities. Track the responses of reintroduced Dakota skippers to those manipulations.	October 2022
3. Analyze data and use findings to develop habitat composition and management prescriptions to promote Dakota skipper population sustainability, and recommendations for additional reintroduction locations.	June 2023

First Update November 30, 2019

While efforts to assess the environmental conditions necessary to maintain and expand Dakota skipper populations is underway, much of the outcomes associated with this Activity are still in the formative stages. The graduate student that will be conducting much of the work associated with this Activity has enrolled at the University of Minnesota and is taking classes. Zoo staff continue to have regular meetings with this student, and a Zoo staff member will likely serve as a member of the student's dissertation committee to advise the research.

In August 2019, Zoo staff collected data on coneflower blooming frequency along transects at the Hole-in-the-Mountain Prairie Preserve in August 2019. Flower heads were censused within semi-circular plots with a 10m radius along these transects. Bloom densities were highest in the areas that had experienced a prescribed fire in the spring of 2018. We will be expanding, and scaling up, this research in future years, likely using more sophisticated methods so that the responses of floral composition to management activities and environmental forces, as well as the responses of Dakota skipper reintroductions to variations in floral composition, can be quantified in a more detailed manner across years.

Zoo staff continued to study the potential risk to prairie pollinators from non-target occurrences of pesticides in prairies. As in previous years (supported by prior ENRTF allocations in 2014 and 2016), samples of little bluestem were collected in late August from points at Hole-in-the-Mountain Prairie Preserve, at Glacial Lakes State Park, and at the Felton Prairie complex (Clay County; home of the last known historic Dakota skipper population in Minnesota). These samples were sent to the USDA's National Sciences Laboratory quantify the precise amounts of nearly 200 pesticides and their residues present on these prairies grasses. Overall, pesticides levels were lower than in prior years, but at least one pesticide was still detected in every sample tested. We detected two insecticides (chlorpyrifos, cyhalothrin), two herbicides (atrazine, metolachor), and nine fungicides (chlorothalonil, azoxystrobin, trifloxystrobin, pyraclostrobin, propiconzaole, tetraconazole, difenoconazole, esfenvalerate, boscalid). We will submit all of these field results (2014 through 2019) for peer review publication in the near future (likely late 2019 or early 2020). To summarize though, we found chlorpyrifos (the organophosphate insecticide commonly applied against the invasive pest soybean aphid) to again be widespread, occurring in every sample submitted (as in 2018). Insecticide levels were comparatively lower to

previous years, perhaps due to lower aphid levels this year across the Upper Midwest that may be tied to the late phenology and the heavy rains that also caused crop failure. The heavy rains may also explain the prevalent of the fungicides, three of which were new to our six year study. It is critical to note that we do not know when or where applications occurred relative to our sample collections, so the levels observed are likely not fully representative of the amounts and composition of pesticides that may have been present in August 2019 at the prairies sampled.

Second Update May 31, 2020

Most of the work towards this activity since the last update has consisted of discussions and drafting of manuscript of the multi-year field pesticides research study for peer-reviewed publication. This includes initial compilation of a geospatial database that will be used to correlate observed pesticide quantities with annual adjacent crop usage and land usage patterns and potential weather and pest abundance. Discussions are also underway to established detailed vegetation monitoring protocols, including through the use of drones and high-resolution imagery, both at Hole-in-the-Mountain Prairie Preserve and at Glacial Lakes State Park.

Third Update November 30, 2020

Baseline vegetation data, particularly the species, location, and abundance of all flowers within the habitat enhancement and reintroduction experiment plots at Glacial Lakes State Park, was precisely quantified by the University of Minnesota's Emily Royer. These data will allow for comparisons of changes in floral composition in future years following the supplementation plantings.

We collected another year of field pesticides data in August. Samples of prairie grasses were collected from the same three Minnesota prairies, and analyzed for about 175 pesticides and their residues by the USDA's National Sciences Laboratory. Results were similar to prior years. The broad-spectrum organophosphate insecticide chlorpyrifos (applied against the invasive soybean aphid) was again widespread, detected in all 15 samples (although never more than 10 parts per billion). Bifenthrin was detected for the first time in 5 years. This is surprising because targeted used of this and other pyrethroid insecticides against soybean aphids has largely stopped following their evolving resistance to pyrethroids. Fungicides were common, with multiple compounds present in every sample and seven detected overall (diphenylamine, azoxystrobin, trifloxystrobin, pyraclostrobin, propiconazole, tetraconazole, and fluxapyroxad). Fluxapyroxad had not been previously detected. No herbicides were detected. We are preparing a manuscript for peer review publication of these pesticides data.

Fourth Update May 31, 2021

Through the winter of 2020-2021, work on this activity has been centered on continued analysis and manuscript preparation associated with the multi-year field pesticides research data.

The PhD student at the University of Minnesota that is supported to help accomplish the goals of this activity has continued to make good academic progress. Planning and necessary training is underway to conduct proof-of-concept detailed monitoring for coneflowers and other key vegetative characteristics with high resolution drone imagery in 2021.

There are multiple groups that are now interested in many of the same questions that we have proposed to study about factors that promoted or caused Dakota skipper persistence and local extinction. We are working with these additional parties to identify unique factors and databases that may be appropriate for range-wide analyses.

Fifth Update November 30, 2021

We are in communication with the US Fish and Wildlife Service about utilizing the federal Dakota skipper database. These monitoring and occurrence records are central to our ability to help estimate the effects of

habitat, climatic, management and other landscape variables on Dakota skipper persistence and recovery. However, a backlog of multiple years of surveys from across the range must be entered into a master database before any analyses can proceed. We are working with USFWS and University of Minnesota biologists to determine the scope of the work. We believe that the work is attainable, but the timeline for achieving the necessary benchmarks for comprehensive analyses may be longer than originally forecast for this Activity.

The University of Minnesota graduate researcher supported through this appropriation has continued to make good academic progress. She recently earned a Remote Pilot Certification from the Federal Aviation Administration that will allow for the collection of high-resolution drone imagery to quantify vegetative and microsite variables for the reintroduction programs.

We collected another year of grass samples from five Minnesota prairies in 2021 for pesticides residue analysis in August. Analyses are still being processed however, so results will be presented in our next update.

Sixth Update May 31, 2022

We remain in communication with USFWS about the federal Dakota skipper database. Backlogged data are still being entered by federal officials, and thus analyses about factors determining Dakota skipper persistence are still pending. This research will likely require more time than initially forecast.

As noted above, we collected another set of field pesticides data in August 2021. Samples of prairie grasses were collected from five Minnesota prairies and analyzed for 192 pesticides and their residues by USDA's National Sciences Laboratory. While observed pesticides quantities were generally low (most quantities at Trace or <10 parts per billion), 4 to 10 different pesticides were still detected in every sample. We detected five insecticides (bifenthrin, λ-cyhalothrin, carbaryl*, thymol, imidacloprid*), one herbicide (atrazine), and eleven fungicides (chlorothalonil, azoxystrobin, trifloxystrobin, pyraclostrobin, fluoxastrobin*, picoxystrobin*, propiconazole, fluxapyroxad, boscalid, flutriafol*, fluopyram*). Pesticides with * indicate new compounds in our dataset. Atrazine was more common in our 2021 samples than previous years, while the usually ubiquitous insecticide chlorpyrifos was absent.

As usual, we do not know when or where applications occurred relative to our collections. It is also unclear what the *in situ* impacts of the composition and quantities of these pesticides might be for species like Dakota skipper.

Seventh Update November 30, 2022

We remain in communication with USFWS about the federal Dakota skipper database. Some data are still being entered by federal officials, and thus analyses about factors determining Dakota skipper persistence are still pending. We are also working to secure a datasharing agreement that will be in compliance with relevant state and federal laws between the US Fish and Wildlife Service and the Minnesota Zoo to be able to access the data. The research associated with this Activity will therefore likely require more time than initially forecast.

Some trial drone imagery was collected summer 2022 at one of the field sites to hopefully help begin developing proof-of-concept protocols for more efficient mapping of Dakota skipper habitat.

We collected another set of field pesticides data in August 2022. These samples are still being processed at the time of this writing, so results will be reflected in a later update.

Eighth Update May 31, 2023

We received the data back on our August 2022 pesticides samples in April 2023. These analyses were funded via non-ENRTF funding. Overall though, pesticides were generally at low quantities. Many of the same compounds observed previously were found again in 14 samples across three Minnesota prairies designated as Critical Habitat for Dakota skipper: atrazine, azoxystrobin, bifenthrin, cyhalothrin-lambda, diphenylamine, fluopyram, fluxapyroxad, hexazinone, picoxystrobin, propiconazole, pyraclostrobin, tetraconazole, and trifloxystrobin. Notable was the absence of the previously nearly ubiquitous organophosphate insecticide

(widely applied against the economically damaging soybean aphid) following the federal revocation of its use in February 2022.

Recent multiple necessary unrelated leaves of absence by key Zoo-associated personnel have slowed progress into research on mechanisms that may have promoted the persistence/extirpation of Dakota skipper populations. We anticipate being able to resume this exploration in fall/winter 2023 following the high-intensity summer field and husbandry season. We will continue to engage with federal and state partners to refine scope and factors of interest.

Nineth Update November 30, 2023

As discussed in Activity 2, intensive floral inventories at the Dakota skipper reintroduction points at Glacial Lakes State Park were collected during the release effort. These data will provide important insights into local factors that may influence Dakota skipper dispersal and behavior. At larger scales of factors that may influence population persistence/extirpation dynamics, new Dakota skipper occurrence classification and probability of occurrence models have recently been developed by external federal research partners. Drawing upon multiple land use, environmental, and climate data layers, the model provides important insights into the predictive power of many of the factors that that we had previously identified that may promote Dakota skipper persistence. Building from this new model, we are narrowing additional potentially informative landscape features to explore further.

Including data from this and prior ENRTF-supported research, we have prepared and submitted a manuscript for peer-review publication on the composition and quantities of dozens of pesticides that we have documented across multiple years in multiple Minnesota prairies that are federally designated as Critical Habitat for Dakota skipper and other species of concern. We will notify the LCCMR if/when this manuscript is formally published.

Tenth Update May 31, 2024

We have now published a scientific paper describing the composition and quantities of pesticides that we have documented between at several prairie preserves federally designated as Critical Habitat for Dakota skippers and other imperiled species. Available at https://link.springer.com/article/10.1007/s10841-024-00572-5, the paper includes samples collected under this and prior ENRTF appropriations. Between 2014 and 2020, we detected eight insecticides, three herbicides, ten fungicides, and three other compounds on larval host grasses for Dakota skipper. Multiple pesticides were commonly present in each sample, particularly broad-spectrum organophosphate (=chlorpyrifos) and pyrethroid (esp. bifenthrin and lambda-cyhalothrin) insecticides in late summer as applications against the invasive soybean aphid. Chlorpyrifos quantities and the number of detected insecticides were lower on average at site(s) where Dakota skippers remain relative to where they have been extirpated.

Beyond pesticides, we remain interested in other landscape factors that have driven persistence and extirpation in Dakota skippers. Independent of this project, some of our collaborators with US Fish and Wildlife Service have utilized the federal database to develop and publish a new species distribution model for Dakota skipper spanning Minnesota, North Dakota, and South Dakota, (https://doi.org/10.3389/fevo.2024.1304748; https://kwb.users.earthengine.app/view/dakota-skipper-model-explorer). The model explores the contributions of many factors that may explain current Dakota skipper occurrence, including climate, vegetation cover, topography, biomass, surface reflectance, disturbance history, and soil characteristics. This model provides a useful framework and filter for additional work that we and others can build upon.

Final Report between project end (June 30) and August 15, 2024

At small spatial scales, we confirmed that narrow-leaved coneflower (*Echinacea angustifolia*) is the strongly preferred nectar source for Dakota skippers. Fine scale mapping of this and other wildflowers in the release plots, paired with detailed behavioral observation mapping of released Dakota skippers and opportunistic observations elsewhere indicates that (at least where it is historically native) narrow-leaved coneflower should be a primary target for habitat enhancement where Dakota skipper populations currently exist or where reintroductions may be attempted. Virtually all observations of Dakota skipper adults in these prairies are from while they are perched and/or feeding on this coneflower, at a significantly higher than expected rate given the availability of it vs other flowers. We have also learned that invasive grasses (particularly smooth brome, *Bromus inermis*) represent a significant threat to Dakota skippers (and many other prairie endemics), both as an ecological trap for larval development and by crowding out native prairie grasses and wildflowers (see Nordmeyer *et al* 2019: https://doi.org/10.3354/esr01136, partially funded by a prior ENRTF appropriation).

We have shown that inadvertent movement of agricultural pesticides into prairies designated as Critical Habitat for Dakota skipper and Poweshiek skipperling are very common, and that there is at least correlative evidence that changes in pesticide types and applications coincide with declines of these two federally protected butterflies. The biological consequences of these exposures need further experimental testing.

At the largest spatial scales, additional research is needed to understand the influences of landscape and regional factors on Dakota skipper persistence and extirpation risk. Some of the environmental variables that we initially identified to be of interest (adjacent land use cover, disturbance history, climate and winter snowpack, soil types, topographic relief, etc.) have now been independently incorporated into the first range-wide species distribution model for Dakota skipper developed by external federal researchers from USFWS and USGS. This model is useful to predict locations that may currently be suitable for Dakota skippers, but it does not necessarily predict which historic factors may have influenced prior extirpation events or other stressors (like pesticides) that are not incorporated into the model. Our ability to explore this question was severely limited by 1) the unexpected leave of absence by the graduate student that we supported to conduct these retrospective analyses, and 2) large gaps in historic survey data that became apparent once the federal Dakota skipper database was fully updated. We hope to pursue these questions in the future.

IV. DISSEMINATION:

Description:

The activities and results of the project will be shared with all named partners and permit agencies through annual reports. The outcomes of the research will be submitted for publication in independent peer-reviewed scientific journals. Findings will also be communicated through the Minnesota Zoo's and the State Parks and Trails marketing and education departments as much as possible, including through webpage and social media channels (mnzoo.org, dnr.state.mn.us/state_parks), as well as presentations by the Project Manager and other Project personnel to the public and other interested parties. Staff, interns, and volunteers at the Zoo and at Glacial Lakes State Park will also be trained to talk about the project, prairie butterflies, and the importance of prairies to the public.

The Minnesota Environment and Natural Resources Trust Fund (ENRTF) 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 Acknowledgement Guidelines.

First Update November 30, 2019

Given the early stages of this project, most of the dissemination has consisted of discussions between staff from the Minnesota Zoo, State Parks and Trails, the University of Minnesota, The Nature Conservancy, and others from the Minnesota Department of Natural Resources, and the U.S. Fish and Wildlife Service. These conversations have large revolved around experimental design and project implementation logistics.

Nonetheless, several media stories were produced in July 2019 about the Dakota skipper reintroduction effort at the Hole-in-the-Mountain Prairie Preserve:

Pioneer Press, July 6, 2019: https://www.twincities.com/2019/07/06/minnesota-zoo-to-release-400-endangered-dakota-skippers-butterflies/

KDLT-TV (Sioux Falls, SD), July 9, 2019: https://www.kdlt.com/2019/07/09/minnesota-conservationists-release-endangered-butterflies-back-into-wild/

KSFY-TV (Sioux Falls, SD), July 10, 2019: https://www.ksfy.com/content/news/Endangered-butterflies-reintroduced-in-Minnesota-512560981.html

KARE11-TV (Minneapolis, MN), July 11, 2019: https://www.kare11.com/video/news/local/kare11-sunrise/sven-explains-the-plight-of-the-dakota-skipper-butterfly/89-5a9cf971-5738-42cf-81ca-7eedd3a48bcf.

Second Update May 31, 2020

The Minnesota Zoo's Prairie Butterfly Conservation Program prepared and submitted the annual report summarizing all aspects of the Program's activities per various federal and state permit requirements in January 2020. Regular conference calls occur among a wide-range of State, Federal, and NGO partners to disseminate results, plan activities, and coordinate next steps. There has been no new media related to this project since the last update, but Parks and Trails staff have held meetings with individuals and associations near Glacial Lakes State Park to raise awareness about the project. Minnesota Zoo staff have also provided overviews of the goals of this project in two public talks (Carver-Scott Master Gardeners, Pollinator Friendly Alliance). ENRTF support was acknowledged in these talks.

Third Update November 30, 2020

While we remain in close communication with all relevant Federal, State, and NGO partners for this project, there have been fewer external communication opportunities due to COVID-19, particularly in person. Notably, State Parks and Trails staff collaborated with the Friends of Glacial Lakes State Park to help with the planting and habitat enhancement work in Fall 2020.

The Minnesota Zoo's project leads have provided updates to all Zoo staff and to the managing Board of the Minnesota Zoological Society about this project. The Zoo has also highlighted the Dakota skipper conservation activities associated with this project through its multiple social media channels.

Minnesota Zoo staff were joined in the field at Hole-in-the-Mountain Prairie Preserve by staff from the Great Plains Zoo (Sioux Falls, SD) to become acquainted with and assist the Dakota skipper reintroduction. The AZA-accredited Great Plains Zoo is interested in potentially becoming a new partner in Dakota skipper and prairie conservation activities in the near future.

On November 19, 2020, Project lead Dr. Erik Runquist provided a live radio interview about this project, prairie conservation, and Dakota skipper reintroductions for KNSI radio (St. Cloud).

Fourth Update May 31, 2021

Through the winter, most project dissemination occurred through the annual report of the Minnesota Zoo's Pollinator Conservation Program. This report summarized all aspects of the Program's activities per various federal and state permit requirements in January 2021. Regular conference calls occur among a wide-range of State, Federal, and NGO partners to disseminate results, plan activities, and coordinate next steps.

In addition to the previously discussed new partnership with the Great Plains Zoo (Sioux Falls, SD) on Dakota skipper rearing, breeding, and reintroductions, the Assiniboine Park Zoo (Winnipeg, Manitoba) has consulted with Minnesota Zoo staff on launching a similar program in Canada. The Minnesota Zoo and Assiniboine Park Zoo already collaborate on parallel conservation programs for the endangered Poweshiek skipperling butterfly (using non-ENRTF funds) in the U.S. and Canada. Minnesota Zoo scientists continue to be asked to serve as experts on several national and international committees dedicated to Dakota skipper conservation.

The Minnesota Zoo's prairie butterfly conservation efforts, including the Dakota skipper rearing and reintroduction program supported by this ENRTF appropriation, were highlighted in a widely circulated story by KARE-11 TV on April 30, 2021: https://www.kare11.com/article/news/local/breaking-the-news/mn-zoo-working-to-restore-two-butterfly-species/89-adfab176-dd23-4fc1-98c2-bb516cba04f7.

Fifth Update November 30, 2021

Minnesota Zoo staff, DNR biologists, and local ranching partners were interviewed in the field at Hole-in-the-Mountain Wildlife Management Area during the Dakota skipper reintroduction for a series of videos that will be featured on the Prairie Restoration Initiative's Virtual Field Day in early December 2021.

We have continued close coordination with Dakota skipper and prairie conservation partners, planning for the 2022 season as well as expanding partnerships. Indeed, Minnesota Zoo biologists have been consulting with two partners Zoos (Great Plains Zoo in Sioux Falls, SD and Assiniboine Park Zoo in Winnipeg, MB) to launch parallel and cooperative rearing, breeding, translocation, and monitoring programs in other parts of the range. In November, Minnesota Zoo staff presented about this project as an invited speaker in a special symposium on imperiled butterfly conservation at the annual meeting of the Entomological Society of Canada.

The Zoo has also highlighted the Dakota skipper conservation activities associated with this project through its multiple social media channels.

Sixth Update May 31, 2022

We continue close coordination with State, Federal, and NGO partners to disseminate results, plan activities, and coordinate next steps.

The Dakota skipper reintroduction was highlighted again the 2021 Minnesota State Pollinator Report, produced by the Interagency Pollinator Protection Team, on which Erik Runquist is the Minnesota Zoo's representative: https://www.eqb.state.mn.us/content/pollinators. This report was submitted to Governor Walz in December 2021, in accordance with Executive Order 19-28.

Project Manager Dr. Erik Runquist provided an overview of ENTRF support for the Dakota skipper program in the public LCCMR Lunchtime Lecture series in February. Dr. Runquist also provide a virtual presentation to all Minnesota Department of Revenue staff in April 2022. He was also interviewed for The Holiday Bonus Episode 40 of Minnesota DNR's Prairie Pod: https://www.dnr.state.mn.us/prairiepod/index.html.

The southern metro SUN This Week newspaper ran a story May 20, 2022: https://www.hometownsource.com/sun_thisweek/community/apple_valley/minnesota-zoo-s-prairie-butterfly-conservation-program-continues-to-grow/article_c6ee54d6-d7b8-11ec-88b4-af844914502e.html.

Minnesota Zoo outreach has consisted social media messaging and the winter "Nature Illuminated" event featuring larger-than-life inflatable representations of many Zoo species, including a giant Dakota skipper perched on a coneflower. This inflatable and other pollinator conservation messaging is also a part of the Zoo's 2022 Farm Babies.

Seventh Update November 30, 2022

Minnesota Zoo continues close coordination with State, Federal, and NGO partners to disseminate results, plan activities, and support federal recovery objectives for Dakota skippers and other imperiled pollinators. Zoo staff are also helping two other accredited Zoos (Assiniboine Park Zoo and Great Plains Zoo) develop the capacity to begin implementing Dakota skipper propagation and translocation programs in future years.

The Minnesota Zoo's Dakota skipper program supported by this ENRTF were mentioned in a great story published by the Star Tribune (https://www.startribune.com/poweshiek-skipperling-butterfly-extinction-endangered-species-minnesota/600210617/?refresh=true) about a concurrent effort by the Minnesota Zoo and other partners (supported by federal, non-ENRTF funding) to try to save the Critically Endangered Poweshiek skipperling butterfly from extinction.

The Dakota skipper reintroduction program is again mentioned in the 2022 Minnesota State Pollinator Report, produced by the Interagency Pollinator Protection Team, on which the PI for this ENRTF project is the Minnesota Zoo's representative: https://www.eqb.state.mn.us/content/pollinators. This report was approved by the Environmental Quality Board November 16 and will be submitted to the Governor in early December 2022, in accordance with Executive Order 19-28.

Minnesota Zoo outreach has consisted of social media messaging. The giant inflatable Dakota skipper perched on a coneflower was featured at the 2022 Minneapolis Monarch Festival, alongside other Zoo-generated pollinator conservation messaging.

Eighth Update May 31, 2023

Minnesota Zoo and State Parks and Trails staff have been meeting regularly to develop an outreach plan associated with the planned Dakota skipper reintroductions at Glacial Lakes State Park. This will consist of coordinated messaging, shared media resources, and potential on-site visits. The support of the LCCMR for this project will be prominently featured.

We also continue to be engaged with federal, state, and other stakeholders to advance conservation planning for Dakota skippers and other prairie-dependent species, within Minnesota and beyond.

Nineth Update November 30, 2023

Minnesota DNR produced an incredible documentary about the Dakota skipper reintroduction effort at Glacial Lakes State Park. It highlights the scope of work, the diversity of contributing partners, and credits the LCCMR. It is posted at https://www.youtube.com/watch?v=a54NErn74VI&t=4s and has been shared on DNR and MN Zoo social media. The documentary was also screened at an outreach event organized by The Friends of Glacial Lakes State Park at the park in September. With approximately 40 people in attendance, Minnesota DNR PAT and Zoo staff spoke briefly and answered questions.

We also continue to be engaged with federal, state, and other stakeholders to advance conservation planning for Dakota skippers and other prairie-dependent species, within Minnesota and beyond.

Tenth Update May 31, 2024

The Dakota skipper reintroduction effort at Glacial Lakes State Parks was highlighted at a well-attended April 20 Spotlight Science series event at the Bell Museum. The DNR-produced documentary about the project (see previous update) was played on loop throughout the museum, and Minnesota Zoo and Parks and Trails staff hosted tables to highlight our work, including Dakota skipper reintroductions, planting recommendations for pollinators, and a demonstration of prairie seed collections. The Zoo's larger-than-life inflatable Dakota skipper was highlighted outside.

Parks and Trails staff affiliated with this project were recipients of 2023 Annual Commissioner's Recognition Awards by the Minnesota DNR.

Dakota skipper conservation efforts and the importance of pollinators were highlighted during the Minnesota Zoo's annual Farm Babies event in spring 2024.

As usual, the Minnesota Zoo's Pollinator Conservation Initiative prepared and submitted a large annual report to federal, state, and other partner permitting agencies detailing 2023 activities, including the Dakota skipper reintroduction effort at Glacial Lakes State Park. We continue to be key collaborators with these agencies and other collaborators to plan and execute actions to advance their recovery.

As mentioned above, Minnesota Zoo staff associated with this project published a scientific paper describing pesticides occurrences and quantities in several prairies. The LCCMR was acknowledged as a key funding source for this research.

Final Report between project end (June 30) and August 15, 2024

No new media or outreach occurred in the final month of this project. Overall though, the Dakota skipper reintroduction efforts and associated habitat enhancement efforts yielded several high profile news stories and outreach products. Highlights include:

- KARE11-TV, July 11, 2019: Sven-explains-the-plight-of-the-dakota-skipper-butterfly.
- KARE-11 TV, April 30, 2021: MN Zoo-working-to-restore-two-butterfly-species.
- Star Tribune: Poweshiek-skipperling-butterfly-extinction-endangered-species-minnesota
- Holiday Bonus Episode 40 of Minnesota DNR's Prairie Pod
- Documentary video by Minnesota DNR & MN Zoo: https://www.youtube.com/watch?v=a54NErn74VI&t=4s
- Features in annual Minnesota State Pollinator Reports by the Interagency Pollinator Protection Team.
- Publication of foundational pesticides exposure data in sites designated as Critical Habitat for Dakota skipper and Poweshiek skipperling:
- A 10' tall, illuminated inflatable Dakota skipper perched on a coneflower that has been used at multiple outreach events.
- Multiple outreach events, reaching thousands of people.

Through the course of this grant, we have built and maintain a large network of partners. These range for federal and state endangered species policy agents, public and NGO land managers, researchers, and other interested parties. Our findings are shared through regular meetings, in permit and funding annual reports, and incorporated into ongoing conservation planning processes that will extend long past this ENRTF support. The ENRTF and the LCCMR will be recognized in products as much as possible and as appropriate.

V. ADDITIONAL BUDGET INFORMATION:

A. Personnel and Capital Expenditures

Explanation of Capital Expenditures Greater Than $5,000: N/A

Explanation of Use of Classified Staff: N/A

Total Number of Full-time Equivalents (FTE) Directly Funded with this ENRTF Appropriation:

Enter Total Estimated Personnel Hours for entire duration of project: **MNZoo:** 10,816; **PAT:** 3494.4	Divide total personnel hours by 2,080 hours in 1 yr = TOTAL FTE: **MNZoo** 5.2; **PAT:** 1.68

Total Number of Full-time Equivalents (FTE) Estimated to Be Funded through Contracts with this ENRTF Appropriation:

Enter Total Estimated Contract Personnel Hours for entire duration of project: **MNZoo:** 5546.6	Divide total contract hours by 2,080 hours in 1 yr = TOTAL FTE: **MNZoo:** 2.67

VI. PROJECT PARTNERS:

A. Partners outside of project manager's organization receiving ENRTF funding

Name	Title	Affiliation	Role
Ed Quinn	Resource Management Supervisor	MN Parks and Trails	PAT's Project manager

B. Partners outside of project manager's organization NOT receiving ENRTF funding

Name	Title	Affiliation	Role
Marissa Ahlering	Lead Prairie Ecologist	The Nature Conservancy	Support at Hole-in-the-Mountain Prairie

VII. LONG-TERM- IMPLEMENTATION AND FUNDING:

MNDNR Division of Parks & Trails has an extensive history restoring and maintaining high quality native prairies through regular, accepted practices for habitat management. Monies for these efforts will be provided through the Parks & Trails Legacy fund and the general fund. TNC plans to continue to manage the HIMPP to benefit native prairie diversity, including rare and threatened species such as the Dakota skipper. The Minnesota Zoo would continue rearing, breeding, and reintroduction efforts. The Glacial Lakes State Park Dakota skipper reintroduction would likely continue into 2024, with monitoring into 2026. Funding from as many sources as possible would be pursued, including the Minnesota Zoo, Minnesota Zoo Foundation, US Fish and Wildlife Service, ENRTF, and other grants.

VIII. REPORTING REQUIREMENTS:

- Project status update reports will be submitted May 31 and November 30 each year of the project
- A final report and associated products will be submitted between June 30 and August 15, 2024.

IX. SEE ADDITIONAL WORK PLAN COMPONENTS:

A. Budget Spreadsheet
B. Visual Component or Map
C. Parcel List Spreadsheet
D. Acquisition, Easements, and Restoration Requirements
E. Research Addendum

Attachment A:
Environment and Natural Resources Trust Fund
M.L. 2019 Budget Spreadsheet - FINAL
Legal Citation: M.L. 2019, First Special Session, Chp. 4, Art. 2, Sec. 2, Subd. 08a, as extended by M.L. 2022, Chp. 94, Sec , 2024]
Project Manager: Cindy Lueth
Project Title: Saving Endangered Pollinators through Data-driven Prairie Restoration
Organization: MNDNR
Project Budget: $170,000
Project Length and Completion Date: 4 years, June 30, 2024
Today's Date: August 15, 2024

ENVIRONMENT AND NATURAL RESOURCES TRUST FUND BUDGET	Budget	Amount Spent	Balance
BUDGET ITEM			
Personnel (Wages and Benefits)	$ 90,000	$ 90,000	$ -
PAT: Dedicated resource staff - native seed collection, cleaning and site preparation, prescribed burning, planting, vegetaion surveys, woody stem shearing, savanna thinning saw work and debris management. The amount per year will be 873.4 hours, times 4 years = 3,494.4 hours/2080 = 1.68 FTE			
Professional/Technical/Service Contracts			
PAT: Native plant plugs grown from Glacial Lakes origin seed; tractor/mower trucking contracts	$ 22,000	$ 22,000	$ -
Equipment/Tools/Supplies			
PAT: Herbicides, hose-sprinklers for experimental exclusion of fire from plots, seeder/tractor supplies; usage costs of tractor/skidsteer to shear 200 acres, interseed 600 acres with truax and/or vicon seeder and cut pile 50 acres savanna. Seed harvest with Gleaner K combine, seed stripper and UTV. Herbicide application with backpack sprayers/UTV boom sprayers.	$ 21,811	$ 21,811	$ -
	$ -	$ -	$ -
Travel expenses in Minnesota			
PAT: resource crew food, transportation costs	$ 24,661	$ 24,661	$ -
Other			
PAT: *Direct and necessary expenses: HR Support (~$2,068, Safety Support (~$428), Financial Support (~$1996), Communications Support (~$1,251), IT Support ($4685), Planning Support (~$1,059) necessary to accomplish funded project.	$ 11,528	$ 11,528	$ -
COLUMN TOTAL	$ 170,000	$ 170,000	$ -

OTHER FUNDS CONTRIBUTED TO THE PROJECT	Status (secured or pending)	Budget	Spent	Balance
Non-State:		$ -	$ -	$ -
State:		$ -	$ -	$ -
PAT: MNDNR habitat mgmt. funding non-LCCMR Parks & Trails Legacy funding $71,644 ($17,911/year) .4 FTE plus materials/supplies.	Secured	$ 71,644	$ 71,644	$ -
In kind:		$ -	$ -	$ -

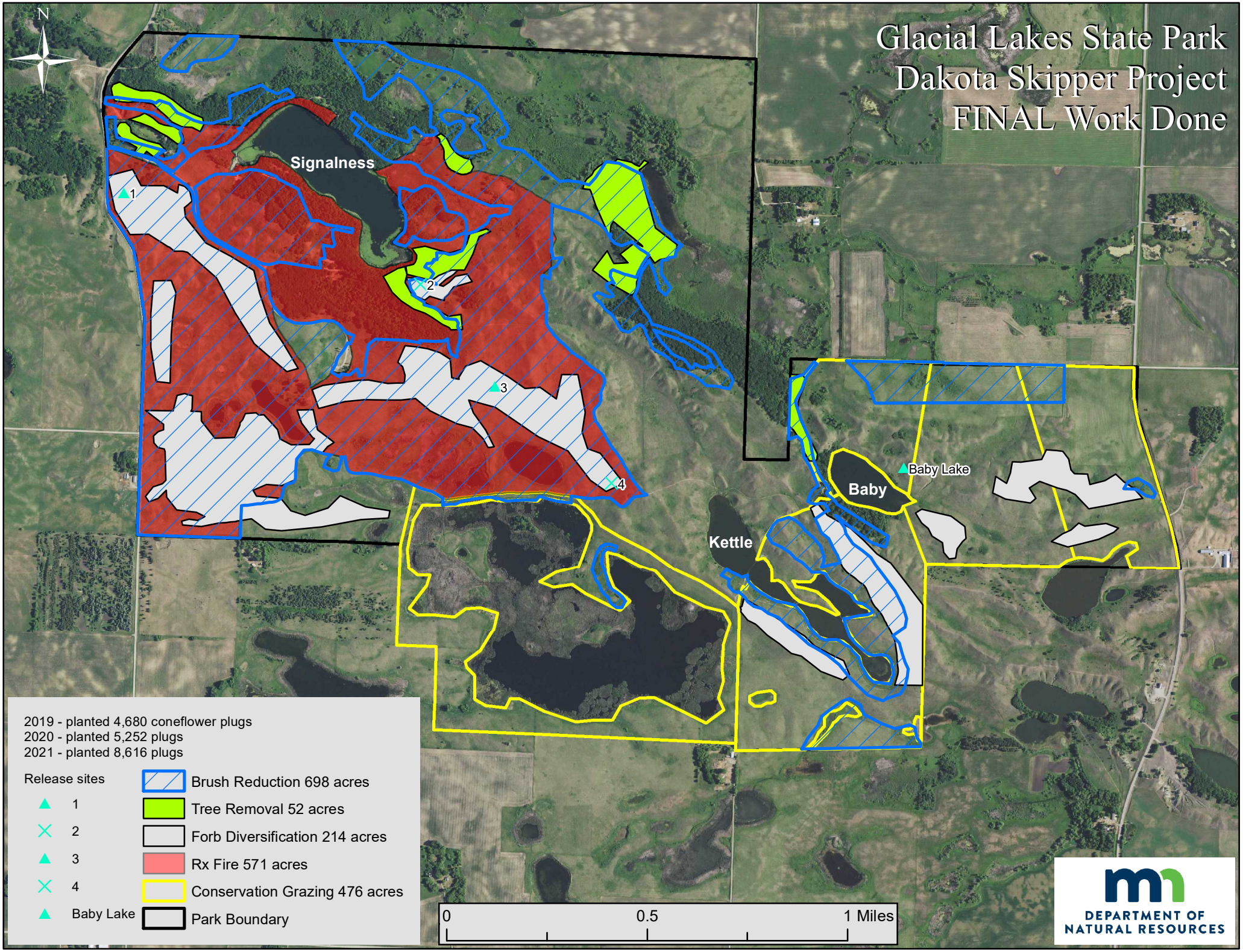
PAST AND CURRENT ENRTF APPROPRIATIONS	Amount legally obligated but not yet spent	Budget	Spent	Balance
Current appropriation:		$ -	$ -	$ -
Past appropriations:				

Attachment A:
Environment and Natural Resources Trust Fund
M.L. 2019 Budget Spreadsheet - FINAL
Legal Citation: M.L. 2019, First Special Session, Chp. 4, Art. 2, Sec. 2, Subd. 08a, as extended by M.L. 2022, Chp. 94, Sec , 2024
Project Manager: Dr. Erik Runquist
Project Title: Saving Endangered Pollinators through Data-driven Prairie Restoration
Organization: Minnesota Zoo
Project Budget: $630,000
Project Length and Completion Date: 4 years, June 30, 2024
Today's Date: August 15, 2024

ENVIRONMENT AND NATURAL RESOURCES TRUST FUND BUDGET	Revised Budget (11/30/2023)	Amount Spent	Balance
BUDGET ITEM			
Personnel (Wages and Benefits)	$ 477,473	$ 476,580	$ 893
ZOO: Butterfly Conservation Biologist (one State Program Administrator Principal at average 65% time, for FY20, FY21, FY22, & FY23; 68% toward salary and 32% toward benefits).			
ZOO: Butterfly Conservation Specialist (one Research Scientist 1 at average 65% time, for FY20, FY21, FY22, & FY23; 77% of dollars toward salary and 23% toward benefits)			
Professional/Technical/Service Contracts			
ZOO: University of Minnesota Research Assistantship (Research Assistantship for a single graduate student; 33% for FY20, 100% for FY21 and FY22), plus travel and supplies and pesticides sample analyses. The Zoo will seek other funds to support the student in FY23.	$ 119,000	$ 119,000	$ -
Equipment/Tools/Supplies			
ZOO: Breeding/Reintroduction: Plants, rearing supplies, collection and release supplies	$ 22,521	$ 22,521	$ -
Travel expenses in Minnesota			
ZOO: Mileage, lodging, meals for travel to and between Minnesota prairie sites for data collection and husdandry/reintroduction operations.	$ 8,759	$ 8,227	$ 532
Other			
ZOO: travel expenses outside of MN. Mileage, lodging, meals for travel to and between prairie sites to obtain Dakota skippers for the Zoo conservation program. The largest viable populations of Dakota skipper butterflies are now outside of Minnesota, particularly in South Dakota and North Dakota, necessitating out of state travel.	$ 2,247	$ 2,247	$ -
COLUMN TOTAL	$ 630,000	$ 628,575	$ 1,425

OTHER FUNDS CONTRIBUTED TO THE PROJECT	Status (secured or pending)	Budget	Spent	Balance
Non-State:		$ -	$ -	
ZOO: Interagency Agreement with the US Fish and Wildlife Service through the Great Lakes Restoration Inititative for partial personnel costs during FY20 and FY21.	Secured	$ 102,000	$ 49,078	$ 52,922
ZOO: The Minnesota Zoo will seek federal or other non-state funding to support about 50% of the remainder of Zoo personnel not funded for this project	Pending	$ 126,115	$ 89,920	$ 36,195
ZOO: The Minnesota Zoo Foundation projects to provide $5,000 annually to the Zoo's section of this program for additional funding for pesticides residue analysis, supplies, and/or travel costs.	Secured	$ 68,000	$ 68,000	$ -
				$ -
State:		$ -	$ -	$ -
ZOO: The Zoo will apply a projected $126,115 during the course of the project using a combination of Legacy and/or other Zoo sources to support about 50% of the remainder of Zoo personnel not funded for this project	Secured	$ 142,000	$ 142,000	$ -
In kind:		$ -	$ -	$ -

PAST AND CURRENT ENRTF APPROPRIATIONS	Amount legally obligated but not yet spent	Budget	Spent	Balance
Current appropriation:		$ -	$ -	
Past appropriations:				
ZOO: M.L. 2014, Chp. 226, Sec. 2, Subd. 05j-1. "Imperiled Prairie Butterfly Conservation, Research and Breeding Program". Expired end of FY17.	$ -	$ 380,000	$ 368,768	$ 11,232
ZOO: M.L. 2016, Chp. 186, Chp. 2, Sec. 2, Subd. 03c1. "Prairie Butterfly Conservation, Research, and Breeding – Phase II". Expires end of FY19.	$ -	$ 421,000	$ 409,874	$ 11,126


Glacial Lakes State Park
Dakota Skipper Project
FINAL Work Done
N
Signalness
Baby
Baby Lake
Kettle
1
2
3
4
Baby Lake
2019 - planted 4,680 coneflower plugs
2020 - planted 5,252 plugs
2021 - planted 8,616 plugs
Release sites
1
2
3
4
Baby Lake
Brush Reduction 698 acres
Tree Removal 52 acres
Forb Diversification 214 acres
Rx Fire 571 acres
Conservation Grazing 476 acres
Park Boundary
0
0.5
1 Miles
DEPARTMENT OF NATURAL RESOURCES