Environment and Natural Resources Trust Fund (ENRTF)
M.L. 2017 LCCMR Work Plan

Date of Submission: November 14, 2017

Date of Next Status Update Report: June 15, 2018

Date of Work Plan Approval:

Project Completion Date: December 31, 2020

Does this submission include an amendment request? No

PROJECT TITLE: Quantifying Benefits and Risks of Pollinator Habitat in Agricultural Landscapes

Project Manager: Daniel P Cariveau

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Location: Southwest Minnesota

Total ENRTF Project Budget:		
	ENRTF Appropriation:	**$500,000**
	Amount Spent:	**$0**
	Balance:	**$500,000**

Legal Citation: M.L. 2017, Chp. 96, Sec. 2, Subd. 03n

Appropriation Language:
$411,000 the first year and $89,000 the second year are from the trust fund to the Board of Regents of the University of Minnesota for pollinator research and outreach, including, but not limited to, science-based best practices and the identification and establishment of habitat beneficial to pollinators. This appropriation is available until June 30, 2020, by which time the project must be completed and final products delivered.

I. PROJECT TITLE: Quantifying Benefits and Risks of Pollinator Habitat in Agricultural Landscapes

II. PROJECT STATEMENT:

The funding we are requesting from Minnesota's Environmental and Natural Resources Trust Fund will allow us to addresses key questions about pollinator habitat.

- The ***first objective*** and the majority of these funds will be used to establish the large, randomized landscape-level experiment to determine how patch size, landscape context and seed mix influence pollinators and beneficial insects. This will lead to the creation of nearly 150 acres of pollinator habitat in corn and soybean growing areas of Minnesota. Using other funds, we will monitor plantings for pollinators and other beneficial insects (see below). This will be, to our knowledge, the most comprehensive and largest randomized, controlled landscape-scale experiment on pollinator plantings
- The ***second objective*** is to determine pesticide exposure risk across pollinator plantings. We will quantify the amount and types of pesticides in these plantings, beginning with the neonicotinoids, and expanding to other pesticides as funds allow. As we will have data on pollinators and other insects, we will be able to relate pesticide exposure to pollinator and beneficial insect communities.
- The ***third objective*** is to disseminate information and experiences to growers by conducting four grower-led field days. A subset of interested growers will help lead these field days as they will highlight their experiences, successes and set-backs with other growers. By having growers lead the content presented at field days, it will lead to greater adoption of and increased effectiveness of pollinator habitat plantings.

The ENRTF funding is an essential component of a large pollinator habitat study. In addition to this ENRTF request, we acquired $500,000 from the Minnesota Department of Agriculture (MDA), that will allow us to install separate plantings of honey bee habitat on different farms to quantify the benefits to honey bee survival and honey production. We also recently received a recommendation of full funding for a competitive national grant of approximately $700,000 in research funds from the United States Department of Agriculture's Agriculture and Food Research Initiative (USDA-AFRI). The USDA and MDA funds will allow us to monitor pollinator plantings.

The ENRTF funding in conjunction with USDA and MDA funds enables us to answer the following five questions:

1) How does the location and size pollinator habitat influence native bee communities, native bumble bee reproduction, honey production and honey bee survival? (USDA-AFRI & MDA)
2) How does the location and size pollinator habitat influence communities of predatory insects that prey upon crop pests such as soybean aphid? (USDA-AFRI)
3) How does the location and size pollinator habitat influence neonicotinoid exposure? (ENRTF)
4) What are costs, benefits and trade-offs of planting pollinator habitat of different sizes in different locations? (USDA-AFRI)
5) How can we most effectively implement pollinator habitat given different budget constraint scenarios? (USDA-AFRI)

WHY? There is a great need to protect and augment native pollinator populations in Minnesota, and increasing floral resources may be the most effective conservation method. Corn and soybean agriculture make up a large portion of the total land use in Minnesota. Increasing pollinator habitat in these agricultural areas offers some of the greatest opportunity for pollinator conservation. However, there are a number of knowledge gaps as to how to best enhance these agricultural landscapes to benefit pollinators.

- ***Where*** *is the best place to create new pollinator habitat?* Areas planted in pollinator habitat that are

surrounded by large amounts of agriculture may not hold remnant populations of native pollinators, and thus may not be helpful in conservation. Conversely, planting pollinator habitat in areas where there already are surrounding patches of natural habitat, such as old fields, roadsides and fallow fields, could greatly enhance communities of native pollinators that are harbored in these small but important natural areas. This study will help land managers prioritize where to place new pollinator habitat.

- ***What size*** *does a pollinator habitat need to be to be effective?* There are virtually no studies on how planting size influences native pollinators. It is critical to understand this as land managers could prioritize habitat placement depending on how much land is available. For example, if small pollinator plantings (e.g. 1 acre) provide little benefit, land managers might not prioritize planting such small patches. Further, effects of the pollinator plantings will be likely influenced by surrounding landscape. For example, a small pollinator patch surrounded by agriculture may provide little benefit compared a larger patch (e.g., 15 acres). Conversely, as bees are small bodied and able to disperse widely, small patches of habitat may be sufficient. More studies are need to understood how the surrounding landscape and size of planting interact to influence pollinator communities.
- ***Which groups*** *of beneficial insects might be enhanced through pollinator habitat, in addition to pollinators?* The adults of a number of native predatory insect species rely on flowers. These natural enemies can provide large benefits to agriculture as they feed their offspring crop pests such as soybean aphids. If pollinator habitat leads to an increase in these predatory species this may lead to a reduction in the amount of insecticides used.
- ***Does pesticide exposure*** *limit the effectiveness of pollinator plantings?* While agricultural landscapes may offer a number of opportunities to plant flowers, it may be that insecticide use negates the effectiveness of pollinator plantings by creating sinks that put pollinators at increased risk of pesticide exposure. Smaller plantings may have greater insecticide exposure risk. On the other hand, some studies have shown that increasing pollinator habitat can reduce the negative effects of pesticides by providing more uncontaminated floral resources. This is a critical but unanswered question.
- *Finally, how can we* ***maximize the return on investment****?* Pollinator habitat is becoming increasingly expensive. It is necessary to determine how to optimize pollinator habitat to maximize the cost-to-benefit ratio. Reducing economic costs of pollinator plantings while increasing their effectiveness is key to land owner adoption.

The key limitation to understanding these questions is that current studies on pollinator habitat have inadequate study designs and are not comprehensive. Nearly all pollinator habitat studies rely on plantings already established through existing conservation programs (e.g., CRP, or reconstructed prairies). The use of already established habitat violates a number of the tenants of strong experimental design. First, it does not allow for *randomization* in the placement of the habitat. Understandably, land managers design habitat programs where they assume it will be most effective, but this introduces bias. Second, *experimental control* is lacking. There is large variation in seed mixes, planting methods, and management techniques, which introduce noise into the study and make it difficult to determine processes and patterns. To overcome these shortcomings, ***we propose to conduct, to our knowledge, the most comprehensive and largest randomized, controlled landscape-scale experiment on pollinator plantings***.

OUTCOMES: Large, landscape-scale experiments are needed; however, they require extensive collaboration and coordination. The funds requested in concert with those from the MDA and USDA present a unique opportunity to accomplish this ambitious experiment. This study will provide highly robust recommendations for creating pollinator habitat that directly considers the economic cost. For example, we will be able to note the cost of different habitat plans and what benefits they provide for pollinators. Using our results, we will develop a decision support tool to help land managers and growers strategically develop and coordinate conservation

actions to benefit native pollinators and native predatory insects in agricultural areas in Minnesota. This tool optimizes effectiveness of pollinator plantings while explicitly considering economic costs. We will assess the risk of pesticide exposure in pollinator plantings. We expect that landowners will be interested in learning if their crop management affects their pollinator plantings. This could lead to a voluntary reduction in pesticide use. Further, we will disseminate these results to growers and land managers. Finally, we note here that this type of project is the gold standard for landscape studies. We have a number of collaborators interested in working with us to study a diverse array of topics such as disease transmission and pollinator nutrition.

III. OVERALL PROJECT STATUS UPDATES:

Project Status as of *June 2018***:**
Project Status as of *December 2018:*
Project Status as of *June 2019***:**
Project Status as of *December 2019:*
Project Status as of *June 2020***:**

Overall Project Outcomes and Results:

IV. PROJECT ACTIVITIES AND OUTCOMES:

ACTIVITY 1: Implement nine different-sized pollinator habitat plantings in two landscape types

Description: ENRTF funds will be used to plant the native floral habitat. We will implement two main experimental treatments to test the effect of this habitat on native pollinators. First, we will install native floral plantings that range in size from 1 to 15 acres. Each size class will increase by 1.75 acres for a total of 9 size classes (1, 2.75, 4.5, 5.75…15 acres). Second, these size classes will be replicated across two landscape types: 1) High agriculture (<1% of 1500m surrounding the planting will be natural/semi-natural habitat) and 2) Moderate agriculture (10-20% of 1500m surrounding the planting will be in natural/semi-natural habitat). This results in a total of 18 plantings (9 in each landscape type) for a total of 144 acres. All s will contain locally-sourced native plants that meet requirements of NRCS CP42 pollinator mixes. We note here that we are using funds from the MDA to plant honey bee habitat, which contains a mixture of native and non-invasive, non-native floral species. We will use the same experimental design. We expect some native bees to forage on the honey bee habitat and some honey bees to forage on the native habitat.

We are focusing on southeastern Minnesota for two reasons. First, this research depends on having locations with high agricultural land use (<1% in natural/semi-natural habitat) and we are confident we can locate sites for plantings that meet this research objective. Second, we will focus on a specific region to minimize variation that can occur across regions (e.g., soil and moisture conditions) and can sometimes mask treatment effects. Finally, we emphasize that these plantings are experimental treatments and not conservation-focused restorations. While they will benefit native insects, the goal of placement and installation is to address specific hypotheses that researchers have not been able to test to date.

Our goal is to place the native pollinator plantings on permanently or long-term protected (e.g. Minnesota CREP, Reinvest in Minnesota, WMAs, CRP, etc.) lands. This will help ensure that the conservation benefits of these practices continue past the life of the project. Second, this will reduce the cost, as ***we will not pay rental fees on land that is currently enrolled in conservation programs***. However, at the majority of plantings, we may have to pay land rental fees. The ability to pay rental fees increases the number of sites available for plantings and thus it is an essential tool to ensure that we can adequately implement our experimental design. If we are able to reduce rental fees requested in Activity 1, we will work with LCCMR staff to redirect the funds to sample for pesticides beyond neonicotinoids (As described in Activity 2). Finally, to determine price of rental fees, we will use county-level CRP rental rates.

We will begin sampling plant communities, native bees, bumble bee reproduction, predatory insects of crop pests, and honey bee survival and honey production in the spring of 2019 following protocols outlined in

the USDA-NIFA grant proposal. Sampling will take place for four years after planting. We note that the sampling and decision tool development for Outcomes 4 & 5 are not directly funded through ENRTF. We have listed them here as we are requesting ENRTF funds to implement the plantings. Using these data, we will create a decision support tool with Eric Lonsdorf – Institute on the Environment, University of Minnesota. While this tool will be developed using USDA funds, we will make it available to growers and conservation practitioners involved in this study as well as throughout the state of Minnesota.

Finally, while we already have generated a great amount of interest among growers and landowners, we highlight here potential alternatives if we are not able to get enough sites for plantings. First, we will prioritize planting of the 18 high-diversity, locally-sourced pollinator plantings (as requested by this ENRTF) over the honey bee habitat plantings (from MDA funding). This is because native plantings will take longer to establish. Second, if we are still unable to acquire 18 sites for plantings, we will reduce the number of size classes in the middle of distribution. This will allow us to test the extremes in size classes (small vs. large) and would still provide valuable information.

Summary Budget Information for Activity 1:

ENRTF Budget: $ 323,939
Amount Spent: $ 0
Balance: $ 323,939

Outcome	Completion Date
1. Find 18 sites for plantings in southeast Minnesota, set-up contracts for 18 plantings.	November 2018
2. Plant 18 sites in high diversity, locally-sourced native seed mix	November 2018
3. Mow and spray plots to control for invasive plants	July 2019-2022
4. Quantify effect of plantings on native bee diversity, bumble bee reproduction, abundance of predatory insects of crop pests, and honey production and honey bee survival. (USDA-AFRI & MDA funding)	Summers 2019-2022
5. Using data from outcome #4 above**,** develop decision support tool to create pollinator planting strategy that maximizes benefits to pollinators and other beneficial insects given budget constraints. (USDA funding).	Summer 2022

Activity 1 Status as of *June 2018***:**
Activity 1 Status as of *December 2018:*
Activity 1 Status as of *June 2019***:**
Activity 1 Status as of *December 2019:*
Activity 1 Status as of *June 2020***:**

ACTIVITY 2: Quantify neonicotinoid residues in nectar at 28 pollinator plantings

Description: Pesticide use, and in particular, insecticides can have large negative effects on native bees and other beneficial insects. This has led to a major concern for placing pollinator habitat in agricultural areas. The risk to pollinators occurs primarily when the insecticide moves off the target crop to nearby wildflowers. The movement can be through the soil, as has been demonstrated for neonicotinoid seed-treated crops, where only 5-10% of the seed treatment moves into the plant and the remainder moves into soil. Depending on the organic content of the soil and amount of sunlight the neonicotinoids may or may not be “bioavailable” meaning able to move into nearby flowering plants. Movement also can be through aerial drift; for example, when neonicotinoid treated seeds are planted in spring the dust may blow off the seeds onto nearby flowers in bloom at that time of year. Aerial drift also can occur throughout the growing season when other pesticides (insecticides and fungicides) are applied to control crop pests, such as soybean aphids, or when herbicides are applied to control weeds. Herbicides do not directly affect pollinators and beneficial insects, but they do pose a risk to pollinator habitat itself.

It is important to study the conditions in Minnesota in which pesticide movement presents the greatest risk. For example, the size of pollinator planting may influence the degree to which pesticides reach the flowers along the edge or in the interior of the planting. We predict that pesticide amount and the number of pesticides found in the interior will be much less in larger plantings compared small plantings, in which case, the future recommendations would be to plant pollinator habitats of a particular size, and to plant a buffer of a non-flowering plant such as grass between the crop and the pollinator habitat.

We will begin by sampling residues of only neonicotinoids in flowers within the pollinator plantings. The laboratory we will use to analyze the residues (USDA-AMS National Science Laboratory in Gastonia, North Carolina; the lab used by researchers nationally) can quantify neonicontinoid residues down to (1.5 ppb). We will sample for 7 neonicotinoids: Acetamiprid, Clothianidin, Dinotefuran, Flonicamid, Imidacloprid, Thiacloprid, and Thiamethoxam. They have another assay that quantifies a broad spectrum of 170 pesticides (insecticides, fungicides and herbicides) but the limit of detection of the neonicontinoids in this second assay is much higher, and thus not as sensitive. We will collect additional flower samples for the second, broad spectrum residue assay and keep in the -80C freezer until funds are available to analyze them.

We will sample from 14 plantings that will be planted in native floral habitat created from this from ENRTF proposal and from 14 plantings that will be planted in honey bee habitat created from MDA funding. As noted above, we are installing an additional 18 plantings based on floral preferences of honey bees. We are sampling these honey bee plantings as these will also be used by native bees. We are sampling 14 plantings of each type (total 28) instead of 18 plantings from each planting type (total 36) due to the expense of residue testing. This number of plantings should provide enough statistical power answer our questions. However, if planting installation costs are less than predicted, we will work with LCCMR staff to expand the scope and sample more plantings. At each planting, we will take one soil sample. This will provide background information on the potential residue already in the soil before planting. As flowers bloom, we will sample residues in flowers on 14 plantings that are sampled on the native bee-focused plantings as well as on 14 plantings of the honey bee-focused plantings. All sampling will take place on Anise hyssop (*Agastache foeniculum*) that will be planted in both types of plantings because it is highly attractive to native bees and honey bees. We will collect 3mg of floral material (minimum amount needed by the USDA laboratory). Within each plot, we will compare the neonicotinoid residue in flowers along the edges to those in the interior. We expect the larger plots will have less residue in interior of the plantings compared to smaller plots. We expect plantings to be of similar shape but we will also record distance from edge to interior and use this distance as predictor in our statistical models. We will sample at three different bloom periods: early, peak and late. As we will have data on pollinator and other insects, we will be able to relate pesticide exposure to pollinator and insect communities.

Summary Budget Information for Activity 2:

ENRTF Budget: $ 155,296
Amount Spent: $ 0
Balance: $ 155,296

Outcome	Completion Date
1. Sample Anise hyssop at 28 pollinator plantings. Sample 2 samples for 3 rounds during bloom.	September 2020
2. Send samples to USDA lab for neonicotinoid analysis	November 2020
3. Analyze pesticide residue data for 7 different neonicotinoids. Compare residue amount at edge and center of pollinator plantings	April 2021
4. Relate pollinator success metrics (see activity 1 above) to pesticide exposure.	December 2022
5. Integrate pesticide risk assessment to decision support tool and other management recommendations.	December 2022

Activity 2 Status as of *June 2018***:**
Activity 2 Status as of *December 2018:*
Activity 2 Status as of *June 2019***:**
Activity 2 Status as of *December 2019:*

Activity 2 Status as of *June 2020***:**

ACTIVITY 3: Conduct four grower-led field days to share experiences installing and managing pollinator habitat plantings.

Description: To disseminate information and share experiences among growers, we will hold a total of four field days in two different years. These field days will focus on growers that participated in the experiment and will allow them to share their experiences with other growers. This peer to peer sharing is critical as other growers have greater knowledge of the concerns, opportunities and impediments to installing pollinator habitat. The field days will be held at pollinator plantings used in the experiment. We will also invite beekeepers and conservation practitioners.

Summary Budget Information for Activity 3:

ENRTF Budget: $ 20,675
Amount Spent: $ 0
Balance: $ 20,675

Outcome	Completion Date
1. Recruit 5 to 8 growers in Southwest Minnesota to present at field days.	January 2021
2. Print out outreach materials and develop decision support tool.	May 2021
3. Advertise field days at local meetings and in grower newsletters.	May 2021
4. Hold 2 field days in 2021 and 2022 at cooperating farms (total of 4 field days).	August 2021 & August 2022

Activity 3 Status as of *June 2018***:**
Activity 3 Status as of *December 2018:*
Activity 3 Status as of *June 2019***:**
Activity 3 Status as of *December 2019:*
Activity 3 Status as of *June 2020***:**

Final Report Summary:

V. DISSEMINATION:
Description: The success of this project relies upon finding growers that are interested in planting pollinator habitat. Our goal is to locate a total of 18 plantings for native, locally-sourced pollinator plantings. An individual landowner may have more than one planting. However, plantings need to be separated by at least 1500 yards. To find growers, we will attend grower meetings, provide presentations and write for newsletters. This is outreach is needed to find locations but will also serve as outreach for the purposes of promoting pollinator habitat. Further, once we have results, we are dedicated to disseminating our results and informing management. We have explicitly budgeted for dissemination and details are in Activity 3 (see above). Further, the Bee Lab at the University of Minnesota is dedicated to extension and outreach. We work with the Bee Squad and Elaine Evans, an Assistant Professor of Extension, is focused on disseminating results of native bee conservation. This will include talks, seminars, and extension materials. These handouts will be available for future outreach and extension opportunities. Further, PI Cariveau and CO-PI Spivak give multiple outreach talks and interviews each year. The results of this study will be shared through these and other programs. Finally, we are developing a decision support tool to optimize the effectiveness of pollinator plantings for a given budget. This tool will be available on our website for growers and conservation practitioners.

Status as of *June 2018***:**
Status as of *December 2018:*
Status as of *June 2019***:**

Status as of *December 2019:*
Status as of *June 2020***:**

Final Report Summary:

VI. PROJECT BUDGET SUMMARY:
A. Preliminary ENRTF Budget Overview:
***This section represents an overview of the preliminary budget at the start of the project. It will be reconciled with actual expenditures at the time of the final report.**

Budget Category	$ Amount	Overview Explanation
Personnel:	$157,652	• Crew Leader 75% FTE at $40,000 base +26.2% fringe + 2% COLA for 3 years (Activities 1, 2 & 3) – manage site selection, grower outreach and contacts, collect pesticide residue
	$73,089	• Postdoc: 100% FTE at $47,500 base + $13,192 fringe for 1 year; 20% in Y2; Activities 1 & 2 – grower outreach, collect pesticide residue samples, manage and analyze data, write scientific manuscripts
Professional/Technical/Service Contracts:	$110,000	• Site prep, seed mix, planting, mowing and weed control, contract administration (Estimate subject to change through bidding process)
	$100,000	• Land rental fees for 100 acres at ~$200 per acre for 5 years. Estimated with goal to use CRP or already protected land. ***If we use already protected land, we will *not* pay rental fees. If we find an adequate amount of protected lands and thus have funds remaining in this category, we will work with LCCMR staff to redirect funds to expand scope of Activity 2. To determine rental fees, we will use county-level CRP rental rates.**
	$38,808	• Pesticide residue analysis will be conducted by the United States Department of Agriculture's National Science Laboratory in Gastonia, NC. ($198 per sample 7 samples at 28 sites)
	$1000	• Outreach event, tent rental, audio equipment rental about $500 per year.

Equipment/Tools/Supplies:	$500	• Supplies include cooler, vials for pesticide residue samples.
Printing	$3,000	• Printing for outreach events with a focus on grower field days. $1500 per year
Travel Expenses in MN:	$15,951	• Travel will be to select plantings, sample native bees and collect pesticide residues.
TOTAL ENRTF BUDGET:	**$500,000**	

Explanation of Use of Classified Staff: N/A

Total Number of Full-time Equivalents (FTE) Directly Funded with this ENRTF Appropriation: 3.45

Total Number of Full-time Equivalents (FTE) Estimated to Be Funded through Contracts with this ENRTF: 2

Appropriation:

B. Other Funds:

Source of Funds	$ Amount Proposed	$ Amount Spent	Use of Other Funds
Non-state: United States Department of Agriculture: Agriculture and Food Research Initiative "Ecology and economics of pollinator habitat: Using a landscape-scale experiment to determine cost-effective restoration strategies for beneficial insects" Proposal #2017–06466; Cariveau PI (Spivak Co-PI) – ***Funding Allocation in Process***	$999,803 ($699,862 for research; $299,941 for indirect costs to UMN)	0	These funds will be used to 1) sample native bee communities, 2) measure reproductive success of bumble bees, 3) sample predatory insects of crop pests in pollinator plantings as well as nearby soybean fields, 4) measure honey bee survival and honey production, 5) determine costs, analyze benefits and trade-offs, and conduct decision analysis of various budget constraint scenarios.
State			
Minnesota Department of Agriculture – M.L. 2017, Chp. 88, Sec. 2, Subd. 02(d)	$500,000	$0	These funds will be used to install habitat that targets honey bees (i.e. primarily stands of mass blooming flowers.) Purchase, manage and sample honey bees.
TOTAL OTHER FUNDS:	**$1,499,803**	**$0**	

VII. PROJECT STRATEGY:

A. Project Partners:

Partners receiving ENRTF funding

- *Dan Cariveau, Assistant Professor, Department of Entomology, University of Minnesota (Principle Investigator)* will oversee all project details and provide reports. He will be responsible for all project reports, supervising crew leader and postdoc and all project management.

Partners NOT receiving ENRTF funding

- *Marla Spivak, Professor, Department of Entomology, University of Minnesota. Co-Principle Investigator* will help with project management, grower outreach and provide scientific advice.

B. Project Impact and Long-term Strategy: This project will be, to our knowledge, the largest landscape-scale experiment on pollinator habtitat. This will provide the most robust and rigorous information in regards to the size and placement for pollinator plantings. Further, it will begin to address how planting size and location influence pesticide risk. This will provide concrete management recommendations to help land managers make important decisions regarding how and where to use limited funds to create pollinator habitat.

C. Funding History:

Funding Source and Use of Funds	Funding Timeframe	$ Amount
ENRTF Award to D. Cariveau "Data Driven Pollinator Conservation Strategies in Tallgrass Prairies" Sampling of tallgrass prairie remnants and restorations for native bees. We are also conducting pollination studies. M.L. 2016, Chp. 186, Sec. 2, Subd. 03a	June 2016-June 2019	$520,000
ENRTF award to M. Spivak in 2014, "Enhancing Pollinator Landscapes" M.L. 2014, Chp. 226, Sec. 2, Subd. 06a Covers D. Cariveau's 9-month academic year salary	August 2015 – June 2019	$329,000
ENRTF Award to Pheasants Forever "Minnesota Bee and Beneficial Species Habitat Restoration" (Cariveau Co-PI) M.L. 2017, Chp. 96, Sec. 2, Subd. 08g	June 2017-June 2021	$206,537 to Cariveau ($732,000 total)

VIII. REPORTING REQUIREMENTS:

- **The project is for 5 years, will begin on 12/15/2017, and end on 12/31/2022.**
- **Periodic project status update reports will be submitted** *June 15* **and** *December 15* **of each year.**
- **A final report and associated products will be submitted between June 30 and August 15, 2023**.

IX. VISUAL COMPONENT or MAP(S):

Environment and Natural Resources Trust Fund
M.L. 2017 Project Budget

Project Title: Quantifying Benefits and Risks of Pollinator Habitat in Agricultural Landscapes
Legal Citation: M.L. 2017, Chp. 96, Sec. 2, Subd. 03n
Project Manager: Daniel P Cariveau
Organization: University of Minnesota
M.L. 2017 ENRTF Appropriation: $500,000
Project Length and Completion Date: June 30, 2020
Date of Report:

ENVIRONMENT AND NATURAL RESOURCES TRUST FUNI BUDGET	Activity 1 Budget	Amount Spent	Activity 1 Balance	Activity 2 Budget	Amount Spent	Activity 2 Balance	Activity 3 Budget	Amount Spent	Activity 3 Balance	TOTAL BUDGET	TOTAL BALANCE
BUDGET ITEM	***Implement nine different-sized pollinator habitat plantings in two landscape types***			***Quantify neonicotinoid residues in nectar at 28 pollinator plantings***			***Conduct four grower-led field days to share experiences installing and managing pollinator habitat plantings***				
Personnel (Wages and Benefits)	$107,488	$0	$107,488	$107,488	$0	$107,488	$15,765	$0	$15,765	$230,741	$230,741
Crew Leader 75% FTE at $40,000 base +26.2% fringe + 2% COLA for 3 years (Activities 1, 2 & 3)											
Postdoc: 100% FTE at $47,500 base + $13,192 fringe for 1 year; 20% in Y2; Activities 1 & 2											
Professional/Technical/Service Contracts											
Site prep, seed mix, planting, mowing and weed control, contract adminstration (Estimate subject to change through bidding process)	$110,000	$0	$110,000							$110,000	$110,000
Land rental fees for 100 acres at ~$200 per acre for 5 years $100,000 total	$100,000	$0	$100,000							$100,000	$100,000
Pesticide Residue Analysis (~$198 per sample, 6 samples per site (2 samples over three rounds) at 28 sites, plus one soil sample per				$38,808	$0	$38,808				$38,808	$38,808
Outreach event, tent rental, audio equipment rental about $500 per year. see printing below for other associated costs with Activity 3							$1,000	$0	$1,000	$1,000	$1,000
Supplies											
Tubes for pesticide residue samples (~1$ each, coolers for transporting samples				$500	$0	$500				$500	$500
Printing										$0	$0
Educational and Outreach Materials: e.g., signs, brochures, handouts, pubs, press releases, fact sheets, estimated $1,500/ year							$3,000		$3,000	$3,000	$3,000
Travel expenses in Minnesota											
Travel and lodging for selecting sites and collecting pesticide residue samples per the University of Minnesota's travel and	$6,451	$0	$6,451	$8,500	$0	$8,500	$1,000	$0	$1,000	$15,951	$15,951
COLUMN TOTAL	**$323,939**	**$0**	**$323,939**	**$155,296**	**$0**	**$155,296**	**$20,765**	**$0**	**$20,765**	**$500,000**	**$500,000**